THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

SEP 6 1990

The Honorable Thomas S. Foley
Speaker of the House of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

I am pleased to submit the accompanying report, entitled "Development of Prospective Payment Methodology for Ambulatory Surgical Services." This report was prepared in response to section 9343(f) of Public Law 99-509, the Omnibus Budget Reconciliation Act (OBRA) of 1986, which states, in part:

> The Secretary shall develop a fully prospective payment system for ambulatory surgical procedures performed on patients in hospitals on an outpatient basis . . . (5) The Secretary shall submit to Congress (A) an interim report on the development of the system by April 1, 1988 and (B) a final report on such system by April 1, 1989 . . . (6)(A) The Secretary shall develop a model system for the payment for outpatient hospital services other than ambulatory surgery. (B) The Secretary shall submit to Congress a report on the model payment system under subparagraph (A) by January 1, 1991.

This report was prepared in the Office of Research and Demonstrations of the Health Care Financing Administration (HCFA). Supportive studies underway by The Urban Institute, Brandeis University, and New York State are reflected in this report.

The interim report, submitted on June 28, 1988, discussed Medicare's payment policies for hospital outpatient surgery and the OBRA 1986 changes to these policies; goals and objectives for a hospital outpatient surgery prospective payment system (PPS); and previous and ongoing hospital outpatient surgery PPS research activities.

Two fundamental aspects of designing a PPS for ambulatory surgical services are:

- selection of a payment unit that defines the health care product being purchased through the prospective rate; and
- the dollar value of the rate, which involves determining the types of provider resource costs to be included in valuing the product.

In our research, several alternatives for defining and pricing hospital outpatient and ambulatory surgical center (ASC) surgery services have been considered, including Diagnosis Related Groups, Ambulatory Visit Groups, Products of Ambulatory Surgery, and Current Procedural Terminology (CPT-4) procedure codes. Our analyses surfaced several significant weaknesses in these systems, and led to the development of a new system called Ambulatory Patient Groups (APGs), which addresses many of the problems inherent in the alternatives. APGs form a clinically based system that groups patients with similar resource utilization and is compatible with HCFA operations. At this point, it is premature to know which system HCFA will adopt, but it now appears that APGs offer the best outpatient PPS alternative for Medicare. The final report due to Congress in January 1991 will make payment recommendations for both surgical and medical services as well as ancillary tests.

Recommendation

While we have identified a number of approaches to pay for hospital ambulatory surgery services under a PPS, we do not believe the payment system should be changed at this time. Our recommendation to maintain the status quo differs from that put forth by the Prospective Payment Assessment Commission (ProPAC). The approach proposed by ProPAC (see Appendix A) would pay hospitals a prospective payment per service based on one-third the ASC rate, one-third the hospital specific rate, and one-third the average hospital cost.

As noted above, we are rapidly moving to develop a comprehensive PPS for all hospital outpatient services, including surgical procedures. When fully developed in January 1991, we will present to Congress a payment system that includes both surgical procedures and medical visits and will be based on appropriate costs of care, while maintaining incentives for efficiency and high quality. Thus, while we agree with ProPAC about the necessity of a prospective system, we believe the system should be changed at a single time and as a coordinated whole.

Sincerely,

Louis W. Sullivan

Louis W. Sullivan, M.D.
Secretary

Enclosure

THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

SEP 6 1990

The Honorable Dan Quayle
President of the Senate
Washington, D.C. 20510

Dear Mr. President:

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Secretary

Enclosure

REPORT TO CONGRESS

DEVELOPMENT OF PROSPECTIVE PAYMENT METHODOLOGY FOR AMBULATORY SURGICAL SERVICES

1990

Louis W. Sullivan, M.D.
Secretary of Health and Human Services

ACKNOWLEDGEMENTS

This report was prepared under the general direction of C. Ross Anthony, Ph.D., Associate Administrator for Program Development, and Joseph R. Antos, Ph.D., Director, Office of Research and Demonstrations (ORD), Health Care Financing Administration (HCFA).

In addition, this report was written under the direction of Mary Kenesson, Director, Office of Demonstrations and Evaluations (ODE), ORD, and Michael Hupfer, Director, Division of Hospital Experimentation (DHE), ODE, ORD. William Sobaski, Director, Division of Reimbursement and Economic Studies (DRES), Office of Research, ORD, also provided valuable technical assistance and guidance.

This report was written by the members of the Hospital Reimbursement Methodology Branch (DHE, ODE, ORD), including Mark Wynn, Branch Chief; Janet Shermer, Project Officer; Joseph Cramer, Project Officer; and Tom Talbott, Project Officer. The Urban Institute, Brandeis University and New York State, who are conducting supporting studies for payment of hospital outpatient surgery, also assisted in writing portions of this report. Typing and clerical support was provided by Kathleen Smith.

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List of Acronyms

ASC	Ambulatory surgical centers
AVG	Ambulatory Visit Group
BMAD	Part B Medicare annual data
CPT	Current Procedural Terminology
CV	Coefficient of variation
DHHS	Department of Health and Human Services
DRG	Diagnosis Related Group
HCFA	Health Care Financing Administration
ICD-9-CM	International Code of Diseases, Ninth Edition, Current Modification
MAAC	Maximum allowable actual charge
MADC	Major ambulatory diagnostic categories
MSA	Metropolitan statistical area
OBRA	Omnibus Budget Reconciliation Act
OPD	Outpatient department
PAC	Products of Ambulatory Care
PAS	Products of Ambulatory Surgery
PPS	Prospective payment system
ProPAC	Prospective Payment Assessment Commission

I. EXECUTIVE SUMMARY

Section 9343(f) of the Omnibus Budget Reconciliation Act (OBRA) of 1986 (P.L. 99-509) requires the Department of Health and Human Services (DHHS) to develop a prospective payment system (PPS) for hospital outpatient surgical procedures. An interim report, submitted to Congress on June 28, 1988, discussed Medicare's payment policies for outpatient surgery and the OBRA 1986 changes to those policies; goals and objectives for an outpatient surgery PPS; and previous and ongoing outpatient surgery PPS research activities, as well as future research efforts. The information contained in this report is based partially upon the research studies for payment of hospital outpatient surgery being conducted by The Urban Institute, Brandeis University, and New York State.

This report updates the discussion in the interim report of trends in Medicare outpatient utilization and payment and presents goals and a conceptual framework for development of a PPS for ambulatory surgical center (ASC) and hospital outpatient surgical procedures, including selection of an outpatient classification system and payment rates. The final sections of the report discuss data limitations, which affect the research on the ASC and hospital outpatient surgery PPS, and describe future research to develop a system for ASC and hosptial outpatient payments..

Two fundamental aspects of a PPS for ASC and hospital outpatient surgical procedures are:

- defining a payment unit that corresponds with the health care product being purchased by the prospective rate; and

- determining payment rates that reflect efficient provider resource costs to be included in valuing the product.

Current research projects funded by the Health Care Financing Administration (HCFA) focus on the cost of surgical procedures within the outpatient setting, cost variation across outpatient departments and the factors contributing to it, and cost and case mix comparisons across the outpatient department and ASC settings. The projects have already yielded useful information, documenting the most important procedures in the outpatient setting, their average costs, deviations from the average, and some of the sources of variation. Much of the research already completed will be improved as additional data from ASC and hospital outpatient settings become available.

In our research, a number of alternatives for defining and pricing PPS units for ASC and hospital outpatient surgery are being considered, including systems based on Current Procedural Terminology Codes (CPT-4), Diagnosis Related Groups (DRGs), Ambulatory Visit Groups (AVGs), and Products of Ambulatory Surgery (PAS).

Although there are hundreds of surgical procedures that are routinely performed on an ASC and hospital outpatient basis, most of the volume is concentrated in a few dozen common procedures such as cataract surgery, diagnostic scope exams, carpal tunnel repair, hernia repair, and D & Cs. Approximately 60 percent of the volume of ambulatory surgical visits in the hospital outpatient department are accounted for by 25 CPT-4 codes. CPT-4 coding for ambulatory surgery in the hospital outpatient department is relatively new, having started in Fiscal Year 1988 (FY 88).

Efforts to reform the payment system for outpatient services have resulted in several different payment systems. HCFA currently has separate systems for hospital outpatient departments and for ASCs, and a fee schedule for outpatient clinical laboratory services. One of the goals of prospective payment for the care of outpatients is to coordinate these systems so that the payment rates for different types of facilities are equal or, if necessary, different only to the extent required to pay for justifiable cost differences. Thus, HCFA's proposal for a new payment system will classify and pay for hospital OPD and ASC surgery using the same, coordinated system.

Starting October 1987, hospitals were required by statute to code outpatient department (OPD) surgery using CPT-4 codes as ASCs do. This makes it possible to compare procedures performed in OPDs and ASCs and leads to standardized reporting of the hospital product from facility to facility. However, because the data are just now becoming available, analysis of the CPT-4 data is still in process.

CPT-4 codes make it possible to develop reformed payment systems because they define medical and surgical procedures in a standardized form that is common for all providers. In the short run, surgery described by individual or groups of CPT-4 codes could be used in developing a PPS. For the longer run, HCFA is developing several approaches for paying prospectively for the facility component of all ambulatory care, whether it is provided in hospitals, ASCs, or other types of facilities such as clinics. Among the policy options evaluated later in the report are the DRG, AVG, and PAS systems. Further research is underway to revise the AVG system for possible use in a PPS for both surgical and medical (nonsurgical) ambulatory care, and to develop the PAS system in coordination with the Products of Ambulatory Care (PAC) system to cover all types of ambulatory care.

While we have identified a number of approaches to pay for hospital ambulatory surgery services under a PPS, we do not believe the payment system should be changed at this time. Our recommendation to maintain the status quo differs from that put forth by the Prospective Payment Assessment Commission (ProPAC). The approach proposed by ProPAC would pay hospitals a prospective payment per service based on one-third the ASC rate, one-third the hospital specific rate, and one-third the average hospital cost.

There are several problems inherent in the ProPAC proposal that argue against its implementation. First, ProPAC assumes that there are justifiable differences between the hospital-based ambulatory surgery payment rates and ASC payment rates. We believe that payments to hospitals and ASCs for similar services should be the same, unless there is justification to differentiate the payments. Second, the ProPAC proposal would cost Medicare over $300 million yearly. Finally, the ProPAC recommendation would be sufficiently cumbersome to administer so that full implementation would take at least a year. The ProPAC proposal is intended to be an interim policy until the implementation of a new coding system, grouper, and payment system. It would be administratively difficult for both HCFA and the providers to implement the interim ProPAC proposal and then to implement another system proposed by HCFA at the conclusion of the current outpatient research.

II. INTRODUCTION

Section 9343(f) of OBRA 1986 requires the Secretary of Health and Human Services to develop recommendations for a PPS for ambulatory surgical procedures performed in hospitals on an outpatient basis. These are procedures that can be performed on an inpatient basis but can, consistent with sound medical practice, be performed on an outpatient basis. The hospital outpatient surgery payment rates must encompass payment for facility services and medical and other health services, other than physician services, commonly furnished in connection with such procedures. Payment rates must take into account justifiable differences in the costs of providing ambulatory surgical procedures in hospital outpatient settings and in ASCs.

Congress requested an interim and a final report by April 1, 1988, and April 1, 1989, respectively. Section 4068(b) of OBRA 1987 further requires the Secretary to solicit and incorporate the views of ProPAC.

The interim report, submitted to Congress on June 28, 1988, summarized Medicare payment policies for hospital outpatient surgery, presented goals and objectives for a hospital outpatient surgery PPS, and discussed relevant research activities.

This report:

- updates the discussion in the interim report of trends in outpatient utilization and payment and Medicare payment policies for ASC/hospital outpatient surgical services (Section III);
- presents goals and a conceptual framework for development of a PPS for ASC/hospital outpatient surgical services (Section IV);
- discusses considerations for the two fundamental aspects of a PPS; i.e., selecting an outpatient classification system and setting payment rates (Sections V and VI); and
- discusses data limitations that affect the design of an ASC/hospital outpatient surgery PPS (Section VII).

III. BACKGROUND

A. Recent Trends

Since 1965, reimbursement for hospital outpatient services has increased faster than any other service covered by Medicare. Change in the Medicare payment policy for inpatient care has been important in causing this rapid growth. The PPS legislation radically restructured the payment system in which short-stay hospitals are reimbursed for inpatient services rendered to Medicare beneficiaries. The new system gives short-stay hospitals the incentive to hold costs down since they earn a profit when their costs fall below the prospective payment, or absorb a loss when their costs exceed the prospective payment. As a result, health care decisions being made in response to PPS are expected to have a profound impact on other providers of health care, especially hospital outpatient facilities. For example, the Physicians' Practice Costs and Income Survey (Health Care Financing Administration, 1983-85) indicates that physicians treating Medicare patients are being encouraged to shorten lengths of hospital stays, reduce ancillary services, and foster outpatient testing.[1] The growth, compared to total Medicare expenditures (Parts A and B), is as follows:[2]

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[1] Department of Health and Human Services, "Impact of the Medicare Hospital Prospective Payment System," 1985 Annual Report, HCFA Pub. No. 03251, pp. 6.10 to 6.14.

[2] The trend data were based upon HCFA's Office of the Actuary's "Cash Benefits by Type" program. These data reflect end-of-year cost settlement and changes due to audit, and as a result differ slightly from the previous statistics included in Section III.B. of the Interim Report to Congress which were based on Medicare claims data.

Pre-PPS for Hospital Outpatient Services

- Between 1977 and 1983, hospital outpatient expenditures increased from $0.8 billion to $2.6 billion, an average annual rate of increase of 23 percent. During the same period, total Medicare expenditures for Parts A and B showed an average annual growth rate of about 19 percent.

Post-PPS for Hospital Outpatient Services

- Between 1983 and 1985, hospital outpatient expenditures increased from $2.6 to $3.7 billion, an average annual rate of increase of 20 percent. During the same period, total Medicare expenditures for Parts A and B showed an average annual growth rate of about 11 percent.

- From 1985 to 1987, hospital outpatient expenditures increased from $3.7 billion to $5.4 billion, an average annual rate of increase of 21 percent. During the same period, total Medicare expenditures for Parts A and B showed an average annual growth rate of about 13 percent.

- From 1983 to 1987, Medicare reimbursement for hospital outpatient services increased as a proportion of total Medicare Parts A and B reimbursement from 4.5 to 6.7 percent.

From 1984 to 1986, surgery services accounted for most of the relative increases in Medicare reimbursement for hospital outpatient services. In 1986, direct surgical services (i.e., operating room, anesthesia, recovery room, blood, medical/surgical supplies) accounted for an estimated 17 percent ($1.4 billion) of all hospital outpatient charges. Medicare covered charges for all services to hospital surgical outpatients in 1986 were $2.3 billion or 28 percent of total covered charges for all OPD services ($8.1 billion). This 28 percent includes both direct surgical services and other services such as drugs, ambulance, etc.

The 10 leading hospital outpatient surgical procedures accounted for about 2/3 ($0.9 billion) of all Medicare reimbursement for hospital outpatient surgery ($1.34 billion or about 26.5 percent of all hospital outpatient expenditures which were $4.9 billion). However, hospital outpatient surgery expenditures comprised only about 2.8 percent of all Medicare hospital expenditures for 1986. Thus, although payment for hospital outpatient surgery is still an important issue, it constitutes a relatively small percentage of total Medicare payments to hospitals. The most frequent surgical procedure was operation on lens (660,000 cases), which accounted for 16 percent of all hospital OPD surgical procedures (4.2 million procedures). The highest average charge per bill ($1,567) was for operation on lens.[3]

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[3] Helbing, Charles and Viola B. Latta, "Use and Cost of Hospital Outpatient Services Under Medicare, 1985,": Health Care Financing Review. Summer 1988, Vol. 9, No. 4, p. 113.

Technological change and Medicare policies have both encouraged hospitals to shift lens procedures to outpatient departments. The two outpatient procedures with the most dramatic growth over 1983 to 1985 were extracapular lens extraction and insertion of the intraocular lens at the time of cataract extraction. Peer Review Organizations have urged providers to shift lens procedures from inpatient to outpatient facilities. Other dramatic increases in utilization of outpatient procedures can be seen for fiberoptic colonoscopies and other endoscopic procedures.

Findings from studies on the impact of the PPS suggest some reasons for rapid growth in hospital outpatient services:

- There are increased financial incentives for hospitals to shift care to ambulatory settings when it is clinically appropriate and cost efficient.

- Surgical and diagnostic technological innovations have enabled hospitals to perform more procedures on an ambulatory basis which has resulted in an increase in Medicare services covered on an outpatient basis (e.g., improved anesthetic agents and the widespread use of endoscopy and laser operations).

- Utilization review policies have influenced the Medicare patient case mix in hospitals. For example, preadmission review for medical necessity, appropriateness, and quality of care encourage treatment in the safest and most cost-effective setting.

- o The addition of ambulatory surgical benefits under Medicare and the repeal of the Part B deductible for home health agency services have encouraged the use of outpatient services (Omnibus Reconciliation Act of 1980, Public Law 96-499).

- o The shift of care to an outpatient setting has reduced the risk of nosocomial infections.

B. Medicare's Current Payment Policies for Ambulatorv Surgical Services

Prior to the 1980s, nearly all major surgical procedures were traditionally rendered in the hospital inpatient setting. Changes in technology and practice patterns resulted in shifting of surgical services to other locations including the physician's office, the hospital OPD and the freestanding ASC. As Medicare payment policies evolved, the ASC and the OPD have undergone numerous payment changes in the last 8 years. Prior to October 1987, hospitals were coding surgery claims using the ICD-9 CM procedure codes but after this date began using CPT-4 procedure codes also used by physicians and ASCs. As a result of OBRA 1986, ambulatory surgical procedures furnished in the OPDs that are approved ASC procedures are subject to a payment system that is based, in part, on the rates calculated for ASCs. The surgical procedures not approved to be performed in ASCs (e.g., pacemaker implant, cardiac catherization) continue to be cost-reimbursed when performed in the hospital outpatient setting.

Currently, all covered ASC surgical procedures are classified into eight payment groups for which eight separate prospectively determined payment rates apply. The revised payment methodology, published February 8, 1990 (55 FR 4526), established these payment rate groups based on data gathered through a survey of more than 300 ASCs, conducted between May and August 1986. Initially, the list of covered ASC procedures defined by specific CPT-4 codes numbered approximately 400. In April 1987 and again in June 1989, the list was revised. It now includes nearly 1,500 approved procedures although many of these procedures are minor variations on each other. The list includes hundreds of operating-room based surgeries, but also includes many procedures such as diagnostic scope exams that are commonly performed in examination rooms. Laboratory and radiology support services for procedures performed in an ASC as well as physician fees and medical items such as durable medical equipment are separately reimbursed under Part B of Medicare.

Ambulatory surgery and related support services rendered in the physician's office, the freestanding ASC and the OPD remain subject to complex reimbursement mechanisms and limitations. The discussions below describe current policies and emphasize the transitional state of reimbursement for ambulatory surgery and for outpatient services in general.

1. Physician Services in Physician Offices

Although this report is not for the purpose of changing physician payments, many ambulatory care visits for such things as minor surgical procedures and scopes occur in the physician office setting. Ambulatory surgery services under Medicare are paid according to where the surgical procedures are performed, which means that Medicare pays different amounts for the same service provided in different settings. While payment for ambulatory surgery services has two components (i.e., physician and facility), there is no separately identified facility component for the physician's office.

As a rule, services including surgical services, which are rendered by a physician to Medicare patients, are generally paid on the basis of "reasonable charges." Medicare pays 80 percent of the reasonable charge and the beneficiary is responsible for the remaining 20 percent as well as an annual deductible.[4] Prior to OBRA 1987, physicians providing services on an assigned basis were reimbursed 100 percent of the reasonable charge for surgical procedures on the list of approved ASC procedures. The beneficiary's deductible and coinsurance obligation were waived. OBRA 1987 reinstituted the deductible and coinsurance requirements effective April 1, 1988, and made other changes applicable to physicians' services:

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[4] For further information about the beneficiary liability, refer to Section III.A.4 of the Interim Report to Congress entitled "Development of Prospective Payment Methodology for Outpatient Hospital Surgical Services."

o Adjustment in prevailing charges for primary care services will be made in localities where the prevailing charges are less than 50 percent of the national average. Effective January 1, 1989, charges were raised to equal 50 percent of the national average.

New physicians who do not have sufficient actual charges to establish a customary charge will have their customary charges set at 80 percent of prevailing charges, adjusted by the Medical Economic Index (except for primary care services and services furnished in Health Manpower Shortage Areas).

o Prevailing charges for a list of procedures identified by Congress in OBRA 1987 as overpriced were reduced. The procedures include bronchoscopy, carpal tunnel repair, and cataract surgery. A 2 percent reduction was imposed across the board for these procedures. Additional reductions up to 15 percent were required, depending on the relationship of the local prevailing charge for a procedure on the list to the national average prevailing charge for the procedure.

- Five percent incentive payments will be added to physician payment for physicians' services furnished in underserved areas/rural areas as defined by the Public Health Service effective January 1, 1989.

2. Hospital Outpatient Surgery

Until October 1, 1987, payment for the facility component of ASC approved ambulatory surgical services provided in a hospital outpatient setting was based upon the retrospective, reasonable cost methodology. OBRA 1986 (section 9343(a)) required that, for cost reporting periods beginning on or after October 1, 1987, these services be paid on the lower of: (1) the hospital's reasonable costs or customary charges reduced by deductibles and coinsurance, or (2) a blended rate, comprised of 75 percent of the amount just described, and 25 percent of (80 percent of) the ASC facility payment rate, net of deductibles. For cost reporting periods beginning on or after October 1, 1988, the blend changes to 50/50. However, section 4068(a) of OBRA 1987 allows eye or eye and ear specialty hospitals that meet certain criteria to retain the

75/25 blend for cost reporting periods beginning in FYs 1989 and 1990.[5]

Prior to 1987, cost-based reimbursement contributed to high rates of inflation in the OPD, since hospitals were essentially reimbursed incurred costs as long as they were deemed reasonable and necessary. While the blended payment rate system should promote Medicare cost savings and payment system uniformity across delivery settings, it is still partly retrospective and retains some of the incentives associated with cost-based reimbursement. Under the blended rate system, hospitals also have an incentive to minimize costs while not reducing reimbursement by changing the mix within each ASC payment rate group to focus on less resource intense procedures.

In Table III-1 prepared from HCFA's 100 percent hospital outpatient surgical file, we see a comparison of the previous payment system amount (i.e., lower of hospital cost or charge) and the ASC average payment rate. These rates are prior to application of 20 percent coinsurance on each procedure's charges. Data taken from claims paid in the first three quarters of FY 88 show that average payments for most ASC procedures are lower than the average costs for hospital OPDs, but that there are a number of exceptions to this generalization. The largest dollar difference occurs in the cataract procedures, which make up a large percentage of the total volume of both ASCs and of hospital OPDs. Lens procedures are the most important single type of surgery done by OPDs, in terms of numbers of cases (20 percent of the total), average Medicare payment rate (see Table III-1), and total reimbursements (47 percent of total Medicare payments to OPDs). Because of the importance of these procedures, the appropriateness of the 44 percent difference between ASC lens procedure payment rates and payments under the blended rate policy to OPDs is the subject of policy interest. It is also possible that higher costs in the hospital OPD result, at least in part, from the fact that hospitals have shifted overhead to the outpatient setting after the implementation of PPS. Therefore, it is also important to compare ASC's and OPD's directly in terms of the resources consumed in producing a given procedure when examining policy in this area.

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[5] For further information about the reasonable cost and blended rate methodologies, see Section III.A.2 and IV B of the interim Report to Congress entitled "Development of Prospective Payment Methodology for Outpatient Hospital Surgical Services."

3. Additional Hospital Outpatient Payment Limitations

Medicare payments for clinical laboratory services (except for inpatient services) are based on a fee schedule established by the Deficit Reduction Act of 1984 and modified by further legislative changes in 1985, 1986, and 1987. Laboratory payments are limited

Table III-1
Comparison of Hospital OPD's with ASC's
20 Leading ASC Approved Procedures by Volume

CPT-4 Code	Description CPT-4 Code	Average Hospital Cost/Charge	Average ASC Payment
66984	Extracapsular Cataract Removal	1092.63	610.48
52000	Cystourethroscopy	301.33	278.66
43235	Upper Gastrointestinal Endoscopy	203.50	277.82
45360	Fiberoptic Colon	217.94	278.82
45378	Fiberoptic Colon, Beyond Spleen	234.23	279.95
66821	Cataract Removal, Laser Surgery	214.94	279.09
43239	Upper Gastrointestinal Biopsy	223.01	280.04
45385	Colonoscopy, Removal of Lesion	276.57	280.55
66983	Intracapsular Cataract Extract	1141.52	614.37
45370	Colonoscopy, Lesion Removal 25 cm	274.68	279.71
19120	Excision of Tumor	505.88	359.40
64721	Neurolysis, at Carpal Tunnel	530.03	358.04
19101	Biopsy of Breast, Incisional	493.55	355.47
45365	Colonoscopy, Brush Biopsy 25 cm	259.70	279.72
45380	Colonoscopy for Biopsy	269.27	280.78
49505	Repair Inguinal Hernia	784.44	410.05
58120	Dilation and Curettage	481.98	359.59
62278	Anesthetic Injection	157.59	279.02
52281	Cystourethroscopy	371.53	357.37
31622	Bronchoscopy	298.67	278.13

Data Notes:

1. Claims processed by 4,800 hospitals from October 1,1987 - June 30, 1988.
2. Data base contains 1.2 million claims.
3. Limited to claims with one surgical procedure per bill.
4. Cost/charge developed from hospital specific cost-to-charge ratios applied to the charges on the bill.
5. The Average ASC Payment figures shown were based on six ASC payment groups proposed in the Federal Register in August 1988 (53 FR 31468), adjusted for geographic variation by the HCFA hospital wage index. HCFA subsequently expanded the number of ASC payment groups to eight (55 FR 4526) and updated the eight ASC payment group rates for services furnished on or after March 12, 1990 (55 FR 4577). Therefore, the amounts shown in the Average ASC Payment column do not reflect the latest ASC rates for comparison with hospital OPDs.
6. Data do not reflect the impact of coinsurance.
7. Lower of hospitals' reasonable cost or customary charge for all ASC approved facility services.
8. The cost of prosthetic devices (e.g., IOLs) is not included in the average hospital cost/charge or ASC payment rate.

by the national Medicare fee schedule amounts for services. Laboratories are required to accept Medicare assignment for these services, and Medicare pays 100 percent of the fee schedule amount which is based on 60 percent of the prevailing charge. A 2 percent differential is paid to sole community hospitals with 24-hour labs serving 24-hour hospital emergency rooms. Section 9339 of OBRA 86 (P.L. 99-509) mandated a study of a national fee schedule.

Section 4066 of OBRA 87 (P.L. 100-203) established that radiology services furnished on or after October 1, 1988, by a hospital on an outpatient basis are paid based on the lower of the hospital's reasonable costs or customary charges or a blended payment amount. This amount is comprised of 50 percent of the lower of a hospital's outpatient radiology costs or charges and 50 percent of 62 percent of the prevailing charge (or fee schedule amount) paid to participating physicians for radiology services furnished in physician offices in the same locality. These payments are net of deductibles and coinsurance payments by the beneficiaries.

4. ASC Payment Methodology

The Medicare payment methodology for ASCs[6] has also been revised. HCFA has expanded the payment groups from four to eight effective for ASC services furnished on or after March 12, 1990, and modified the methodology for calculation of the payment rates.[7] A cost and charge survey conducted by HCFA in 1986 at over 300 ASCs generated data for 1,200 of the 1,535 currently approved procedures. Ninety facilities included in the survey were audited to validate their reported costs and charges. A cost-to-charge ratio was developed from the audited facilities and applied to the charge for each procedure for each facility in the survey. The results were adjusted for the HCFA hospital wage index, weighted for Medicare frequency, and arrayed in descending order. A classification system was developed based on intervals of the cost per procedure. Clinicians further reviewed the results and made adjustments to the groups where appropriate. The new ASC payment rates published in February 1990[8] are as follows:

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[6] For further information about ASCs, see Section III.A.3 of the interim Report to Congress entitled "Development of Prospective Payment Methodology for Outpatient Hospital Surgical Services."

Group 1	$260	Group 5	$561
Group 2	$348	Group 6	$730
Group 3	$400	Group 7	$779
Group 4	$492	Group 8	$844

In addition, section 4063(b) of OBRA 1987 mandated that effective July 1, 1988, ASC payment rates include a payment for intraocular lenses that is reasonable and related to the acquisition cost of the class of lens involved. A payment amount for the lens is included in the appropriate ASC payment group rate.

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[7] "Revision of Ambulatory Surgical Center Payment Rate Methodology," Federal Register 55:27, February 8, 1990, pp. 4526-4577.

[8] Published in Federal Register February 8, 1990 (55:4577).

Multiple surgical procedures performed in the ASC continue to be paid at 100 percent for the surgery in the highest payment group and 50 percent of the payment group rate applicable for all other surgical procedures performed. Termination of a procedure may still result in payment depending on the stage of the operation at the time of termination.

IV. DEVELOPMENT OF PROSPECTIVE PAYMENT METHODOLOGIES FOR AMBULATORY SURGICAL SERVICES

A. Goals for Ambulatory Surgery Payment System

The ultimate goals of a PPS for ASC hospital-based outpatient surgery include:

- The payment system should include incentives to deliver services efficiently, thereby minimizing costs to the Government and reducing the rapid increase in Medicare outlays for ambulatory surgery.

- The payment rates should reflect, or be adjusted only for, identifiable and justifiable differences in the case mix index and cost of resources (e.g., geographic differences in wages).

- Under the new payment system, total Medicare outlays should be no greater than what would have been paid under the current payment system.

- Ideally, the same basic methodology should be used to pay for generally similar patient care regardless of the setting in which the care is rendered (i.e., hospital outpatient or freestanding setting).

- The payment system should continue to allow for beneficiary access to quality care.

- The payment system should allow providers to predict revenues for care provided. This will foster better planning and management by the providers.

- The patient classification system upon which the system is based should consist of homogeneous visit/procedure groupings in terms of average, relative resource use.

- The administration of the payment system should be relatively simple from the perspective of providers, fiscal intermediaries, and beneficiaries.

- The payment system, and any bundles of services included in the system, should be designed so that there is limited opportunity to influence the patient groupings, or any of the other bill data, solely for the purpose of receiving higher payments.

B. Two Fundamental Aspects of an Ambulatory Surgical PPS

There are two fundamental issues to be decided in designing a PPS for ambulatory surgical services (this includes hospital-based or freestanding services):

- Defining a payment unit that corresponds with the health care product being purchased by the prospective rate.

- Determining payment rates that reflect efficient provider resource costs to be included in valuing the product.

Each of these issues is discussed in more detail in Sections V. and VI. below.

V. SELECTION OF A CLASSIFICATION SYSTEM

Selection of a classification system is fundamental to development of a case mix-related payment system because it defines the product produced by the provider and can be used as the unit of payment, leading to the pricing of that product. A number of candidate product units are possible, including the medical procedure, the patient visit, the patient's diagnosis, the episode of care (which may include several separate visits), and all-inclusive payment units for all services to the beneficiary (i.e., capitation).

A. Importance of a Classification System

A well developed classification system will be logical, capable of acceptance by hospitals and freestanding facilities, exhaustive (it will include all types of ambulatory surgery), and the classes will be exclusive (each type of ambulatory surgery will fall into one and only one class).

The classification system, or taxonomy, provides the organizing principles through which outpatient surgery is viewed. The Federal role in standardizing product definition has important secondary effects. For example, the use of DRGs for hospital inpatient care has brought about important changes in the language, accounting, research, and planning of hospital services, both within and outside of the Medicare program. Adoption of an ambulatory surgery taxonomy and unit of measurement by Medicare will support its acceptance throughout the health care industry and, if properly chosen, could foster widespread improvements in the financing and delivery of these services.

B. Goals of the Classification System

1. Homogeneous Product Groups

The hospital's or ASC's "product," or service should be defined into homogeneous groups. The basis for commonality may be clinical similarity (e.g., the same diagnosis or type of patient) or resource similarity (e.g., charges, operating room time, or labor costs). The purpose for which the system is designed will determine the relative importance of these types of homogeneity. The preferred taxonomy will have product groups that are homogeneous both clinically and in resource intensity.

If there are wide variations within product groups, it may be difficult to develop payment levels that are equitable. For example, if the same product group includes both inexpensive, clinically simple and relatively expensive, clinically difficult ones, the adequacy of the payment rate for the product group will depend on the actual distribution of cases in a given facility. If the distribution of expensive and inexpensive cases in the facility is similar to the distribution reflected in the payment rate, then aggregate payments will be appropriate; however, a hospital or ASC that consistently treats more clinically difficult, costly cases may be penalized because of the patients it attracts, rather than due to any inefficiencies. Consequently, these providers would be encouraged to treat less costly Medicare cases, and discouraged from treating complex Medicare cases within the same product group.

2. Clinically Meaningful Groups

Clinically meaningful definitions of outpatient surgery groups will foster provider acceptance of a PPS. Most providers organize departments and recruit personnel on the basis of clusters of expertise, and the purchase of equipment and the fiscal management of the provider typically follows this organization.

The PAS system in New York State breaks up surgical specialities into groups that are based on body systems, but breaks these groups into smaller classes which are homogeneous with respect to resource use. For example, therapeutic surgical procedures for female organs are divided into D & C, ovary, and the general GYN procedures. Similarily, therapeutic and diagnostic surgical procedures for the GI system are broken into upper GI, lower GI, and rectal procedures because of different average operating room resource use. Thus, some combination of systems reflecting clinical characteristics and resource use may be desirable.

3. Responsive To Technological Change

The processes and principles guiding the initial development of the system should be an enduring framework for replication and extension. At the same time, it is important to incorporate flexibility into a classification system because dramatic changes in practice patterns are likely to occur over time.

Ambulatory surgery can be viewed as part of a continuum of health care services, with higher intensity inpatient surgery and procedures at one end, ambulatory surgery in the middle, and a set of lower intensity clinic/physicians' office procedures at the other end. The location of various kinds of services along the intensity continuum shifts frequently in response to changing technologies, drugs, support services, regulations, and accepted practice patterns. Any ambulatory surgery classification system should be able to be adapted to such changes appropriately without major threats to the integrity of the system.

It may be necessary to value (price) individual components of the product unit (e.g., pharmaceuticals, prosthetics, labor, and supplies) and later to combine these components. A good product definition will allow for the separation, removal, and addition of components without seriously unbalancing the classification scheme.

4. Administrative Simplicity

Both providers and payers are concerned about the operational implications of proposed systems. A minimal number of groups will ease administration for both the facility and the payor.

Ambulatory surgery occurs in a variety of settings with varying levels of administrative sophistication. The system should be as simple as possible so that the administrative aspects of its implementation and ongoing operation are compatible with existing procedures and resources for billing, coding, data collection, storage, and processing. This will decrease errors, decrease costs, and minimize other administrative problems.

5. Minimize Potential for Coding Errors and Upcoding

Upcoding occurs most readily when boundary definitions between the classes are unclear, making it possible for a provider to place a case into a more expensive class in order to maximize reimbursement. Typologies that have excessive numbers of classes or in which the organizing principles are unclear are believed to be especially vulnerable to upcoding and coding errors. To mitigate the potential for coding errors, payment units should be as broad and inclusive as possible without losing homogeneity.

C. Payment Units and the Current Payment Methodologies

The Medicare program has made progress in recent years in standardizing payment units and in rationalizing the payment system for outpatient surgery. Up to October 1987, hospitals normally billed for outpatient services by department and standardized coding was not required. Thus, an aggregate bill for "operating room" of $500 might appear with a series of itemized charges for various supplies and services, but no standard hospital product was specified. Comparisons of costs between various hospitals and between types of providers was thus difficult. Changes in billing procedures instituted in the last few years for ASCs and hospital OPDs require CPT-4 coding for surgery and have led toward a more standard outpatient surgical product definition.

As explained in Section III, ASCs are paid by Medicare on the basis of a classification system that places procedures into payment groups. The classification was made on the basis of resources needed for the procedures. HCFA has published a list of surgical procedures that are acceptable for performance in ASCs, based on medical advice. ASCs are required to code these procedures using CPT-4 codes, and they are reimbursed by Medicare according to their inclusion in one of the four payment rate groups.

Effective October 1, 1987, a hospital's aggregate Medicare payment for ambulatory surgeries approved for provision in ASCs is based on the lower of the hospital's reasonable cost or customary charges net of deductibles and coinsurance, or a blended amount comprised of the lesser of the hospital's reasonable cost or customary charges, after application of coinsurance and deductibles, and the associated ASC payment rates net of deductibles and coinsurance. In computing the blended rates, the hospital's billed charges are limited to those which apply to the CPT-4 outpatient surgical procedure and the services that were provided on the day of surgery. This bundling of services represents an improvement over the pre-October 1, 1987, approach, since the all-inclusive day-of-surgery bill now reflects a somewhat more standardized package of services. In the long run, for a more useful payment unit, other supplies, ancillaries, and personnel that are also related to a procedure should be integrated into the procedure package or bundle.

There are several advantages to using the CPT-4 procedure coding system as the foundation for the payment unit. Most health care providers, including physicians, health care facilities, and third party insurance carriers are familiar with the coding terms and structure and accept them. The CPT-4 can be used for comparative analysis across different groups, including hospitals (inpatient and outpatient procedures), ASCs, clinics, physicians' offices, and different payers. The coding system is sufficiently detailed to recognize all physician procedures performed by the different health care providers.

One problem with using CPT-4 codes to define the unit of payment is that they do not reflect "bundles" of codes that describe all the procedures and/or medical treatments typically performed for a patient with a given diagnosis. In the absence of bundling, facilities have incentives and mechanisms to increase the volume of procedures such as laboratory and diagnostic tests, and high volume leads to high costs. Thus, CPT-4 codes may need to be bundled into a more comprehensive payment unit if they are to encourage efficient utilization.

Another problem may be the thousands of CPT-4 codes, originally designed as a physician-related coding scheme. There are approximately 2,500 CPT-4 codes applicable to ambulatory surgery. The large number of CPT-4 codes is problematic, since it makes coding "creep" more likely to occur. This happens when a provider upcodes enough that its case mix index increases, as does its reimbursement amount.

Despite the large total number of CPT-4 codes, a relatively small number of codes covers the majority of ambulatory surgeries. Preliminary 1987 data indicate that 20 percent of surgeries are cataract removals and insertion of a prosthetic lens. ASCs have an even higher concentration of lens surgical procedures. About 60 percent of all ambulatory surgeries for Medicare patients fall into the 25 most common codes (see Table V-I).

Preliminary analyses of CPT-4 coded procedures in the outpatient department show relatively good homogeneity of hospital outpatient charges in the top 25 CPT-4 codes. The coefficients of variation (CV) range from .37 to .90, with an unweighted mean CV of .62.

Despite some problems, the CPT-4 codes are widely accepted and are now operational. They are clinically based, although some analysts believe that a more proper definition of a standard hospital "product" can be achieved. The CPT-4 system has the major advantages of being operational and workable.

D. Options for Change

In the short-run, the CPT-4 codes and ASC categories could be considered as a basis for constructing a PPS for hospital outpatient departments. However, there are several longer-run options which could be used for both an ASC and a hospital outpatient surgery typology.

Table V-1
Mean Total Billed Charges for The Leading Twenty-Five Ambulatory Surgery CPT-4 Codes Hospital Outpatient Departments

1987 CPT-4 Code	Description	Percent of Total	Mean Total* Billed Charges	Coefficient of Variation
66984	Extracapsular cataract removal with lens insertion	19.7%	$2,031.38	0.37
52000	Cystourethroscopy	3.9	531.34	0.85
43235	Upper G.I. endoscopy for diagnosis	3.2	361.91	0.67
45360	Fiberoptic colonoscopy to splenic flexture	3.1	384.39	0.63
45378	Fiberoptic colonoscopy beyond splenic flexture	3.0	397.12	0.60
66821	Secondary membranous cataract discission, by laser	2.8	309.57	0.58
43239	Upper G.I. endoscopy for biopsy	2.5	426.61	0.58
45330	Sigmoidoscopy	2.1	238.51	0.90
45385	Colonoscopy beyond splenic flexture for lesion removal	2.0	506.49	0.54
66983	Intracapsular cataract removal	1.8	2,059.12	0.36
45370	Colonscopy to splenic flexture for lesion removal	1.3	492.43	0.54
19120	Excision of fibroadenoma from breast	1.3	982.03	0.52
36430	Blood transfusion	1.3	479.03	0.74
64721	Neurolysis of median nerve at carpal tunnel	1.2	882.08	0.50
19101	Breast biopsy, incisional	1.1	978.43	0.52
45365	Colonoscopy to splenic flexture with brush biopsy	1.1	493.43	0.58
12001	Simple repair of wound, less than 2.5 cm	1.0	147.72	0.86

Table V-1
(Continued)

1987 CPT-4 Code	Description	Percent of Total	Mean Total* Billed Charges	Coefficient of Variation
45380	Colonoscopy beyond splenic flexture with brush biopsy	1.0%	$ 489.44	0.54
49505	Repair of inguinal hernia	0.9	1,262.26	0.45
58120	D & C	0.9	913.28	0.43
65855	Trabeculoplasty by laser	0.9	255.81	0.80
67228	Destruction of retinopathy by photocoagulation	0.7	229.40	0.58
52281	Cystourethroscopy	0.7	691.13	0.67
45300	Proctosigmoidoscopy	0.7	203.76	0.80
12002	Simple repair of wound, 2.6-7.5 cm	0.7	163.38	0.90
	Percent of dollar volume accounted for by leading 25 CPT-4 codes (151,599 visits multiplied by mean total billed charges of $1,049.40).		72.7%	
	Percent of visits accounted for by the top 25 codes based on 257,542 visits	58.9%		

Data source: HCFA hospital OPD billing file, first quarter FY 1988 (October-December 1987).

(Lion, et al., 1988, Tables 9 and 10).

*Not adjusted for wage index.

The charges on this table exceed the lower of hospital cost/charges on table III-1 for three reasons: (1) charges exceed costs; (2) the charges include prosthetic devices such as IOLs; and (3) the charges include total billed charges for the patient and are not limited to HCFA approved facility services for the procedure.

1. DRGs

The DRG system, implemented for inpatient hospital care starting in October 1983, is widely believed to be responsible for slowing the rate of inflation in inpatient costs due to the incentives of a PPS. However, these savings may be partly offset by increased costs at other types of providers as patients shift to OPDs, skilled nursing facilities, and other sites of care. The DRG system divides inpatient hospital care into diagnostic categories. The hospital knows in advance of treatment the amount Medicare will pay for the care of a given patient, and thus has incentives to restrict its costs to those that are necessary. Because they are familiar to clinicians and acute care hospitals, it is logical to consider the use of DRGs for ambulatory surgery.

Analyses of inpatient DRGs for applicability to ambulatory surgery suggest that this system is inappropriate for use in ambulatory care settings. In most cases, the costs of a procedure done in inpatient settings are greatly different from the costs of the same procedure done for ambulatory patients, and the relative cost of one procedure to another is also different, so the DRG weights would need a total revision. This disparity is exemplified in Table V-2 by the 10 leading outpatient surgical procedures in the hospital OPD, along with their inpatient DRG weights and mean outpatient charges. The DRG weights reflect the charge of

Table V-2
Leading Ten Surgical DRGs with Ambulatory Surgery Procedures by Ratio of DRG Weight to Mean Charges

DRG Number	Surgical DRG Description	DRG Weight	Mean Charges*	Ratio of weight to Mean**
39	Lens procedures	0.57	$1,534	26.9
364	D & C, conization except for malignancy	0.39	638	16.4
6	Carpal tunnel release	0.41	653	15.9
42	Intraocular procedures except retina, iris and lens	0.65	1,032	15.9
262	Breast biopsy and local excision for non-malignancy	0.43	668	15.5
40	Extraocular procedures except orbit, age 65 or over	0.41	573	14.0
38	Primary iris procedures	0.40	276	6.9
157	Anal procedures over age 69 or with comorbidity	0.73	414	5.7
270	Other skin, subcutaneous tissue and breast operating room procedures under age 70 without comorbidity	0.76	307	4.0
269	Other skin, subcutaneous tissue and breast operating room procedures over age 69 or witn comorbidity	1.13	276	2.4

Source: HCFA 1985 hospital OPD 5 percent sample file. Weights from ProPAC for 1985.

*Not adjusted for wage index.

**$\left(\frac{\text{Mean Charges}}{\text{DRG Weight}}\right) \div 100$

the specific procedure compared with the mean charge for all the procedures for all Medicare patients receiving inpatient treatment. Thus, inpatient lens procedures are 57 percent as costly as the mean case, while carpal tunnel release is 41 percent as costly. If the identical outpatient procedures had charges in proportion to the inpatient procedures, the ratios of outpatient charges to DRG weights would be similar. However, the ratio is seen to vary from a high of 26.9 to a low of 2.4, a large range, thus showing that present Medicare DRG relative weights are inappropriate for surgery in ambulatory care settings.

One reason for the cost differences between the inpatient and outpatient procedures is that many of the DRGs are relatively heterogeneous, including a series of procedures ranging from simple to relatively complex. However, only the relatively simple procedures within these DRGs are typically performed on an outpatient basis. On Table V-2, this is especially true for the anal and the skin procedures. This means that the weights used to describe the costs of inpatient procedures do not correspond with the weights of the outpatient procedures, even within the same DRG. It also means that the types of procedures included within the DRG are different for the two settings, and that the DRG is therefore not descriptive of the same range of procedures. Thus, many of the ICD-9-CM procedure codes would need revision prior to use for payment of care in an ambulatory care setting.

Even if problems of weighting and DRG group content were solved, the logic of DRGs does not fit in well with the structure of ambulatory care. Almost half (47 percent) of outpatient procedures, such as simple skin suturing, simple splinting, and all scope procedures are not sufficiently serious to require hospitalization. For example, colonoscopies are listed as a procedure in the CPT-4 typology, but would likely fall into a medical DRG such as one for lower GI pain. Thus, DRGs do not have specific codes for a large portion of ambulatory procedures, and often deal with these procedures in medical rather than surgical DRGs.

Another problem of using DRGs for ambulatory care (though not for surgical procedures) is that large numbers of ambulatory visits are for well patient care such as physical examinations and medical counseling. If the PPS for ambulatory surgery is to fit as part of an overall PPS for ambulatory care, then the overall system must be able to deal with visits not caused by a diagnosis, and DRGs are by definition not designed for that task.

In fact, about half of the ambulatory surgery charges fall into medical (rather than surgical) DRGs and would need to be redefined. Finally, the DRG system is relatively complex and requires sophisticated data processing facilities for billing and auditing purposes (see Appendix C).

Could DRGs, or a system like it, be developed that would be regrouped and reweighted to be appropriate for ambulatory surgery, based like DRGs on the diagnosis of the patient? Work is now underway to refine AVGs for potential use in a PPS for hospital and ASC care.

2. Ambulatory Visit Groups

The AVG system was developed by the Yale University Health Systems Management Group which also developed the inpatient DRGs. AVGs constitute a visit-based outpatient classification system that can be used in multiple ambulatory settings: hospital OPDs, hospital emergency departments, ASCs, and physician offices. Most AVGs are formed based on the following patient data: ICD-9-CM principal diagnosis, CPT-4 procedure, age, sex, and new or established patient status. The AVGs are formed by first assigning visits to one of 19 Major Ambulatory Diagnostic Categories (MADCs) that correspond to a major body or organ system, such as the nervous system or musculoskeletal system (see Table V-3). Using a combination of clinical judgment and statistical analysis, the MADCs are broken down into 570 AVGs. Visits that are not related to an organ system (e.g., prevention or administrative) are grouped by type of visit.

The AVG system is based on clinical diagnoses and is therefore clinically meaningful. The system is based on the single

Table V-3

Major Ambulatory Diagnostic Categories (MADCs)

Body system-related visits	MADC no.*
Nervous system	1
Eye	2
Ear, nose, throat and respiratory system	3
Circulatory system	5
Digestive and hepatobiliary system and pancreas	6
Musculoskeletal system and connective tissue	8
Skin	9
Endocrine, nutritional and metabolic diseases and disorders	10
Kidney and urinary tract	11
Male reproductive system	12
Female reproductive system	13
Pregnancy, childbirth, and the puerperium	14
Newborns and neonates	15
Blood and immune system	16
Malignancy (excluding carcinoma of skin) and myeloproliferative diseases	17
Systemic infectious and parasitic diseases	18
Mental diseases and disorders and substance abuse	19
Injuries, poisonings, and toxic effects of drugs	21
Non-body system related visits	
Preventive, administrative, and other therapeutic encounters	23

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* Some numbers are skipped in order to make MADCs correspond with Major Diagnostic Categories (MDCs) used for inpatient DRGs.

ambulatory visit rather than an "episode" of care, as the building block of ambulatory care. Researchers at Brandeis University have determined that the AVG system accommodates a relatively large percentage of surgical procedures within a small number of AVGs; 25 AVGs account for about 75 percent of all surgeries and 80 percent of billed charges. The AVGs appear to have sufficient homogeneity for a valid coding system. The CV of charges in the top 25 AVGs range from 0.37 to a high of 1.21. The highest CV was for certain high-technology eye surgical procedures. While some of the AVGs have relatively high CVs, they are generally lower than the CVs of the inpatient DRGs used in the development of the inpatient PPS (see Appendix D).

One advantage of the AVG system over CPT-4 codes is that it is designed to bundle services that are done in one visit into a single unit of payment. Since there should be no additional payments for (extra) tests during a visit, physicians or hospitals have fewer incentives to increase volume by ordering extra tests or other procedures. These incentives for efficiency should lead over the long run to lower costs.

AVGs are not yet fully developed with their associated weights for payment, and further research is required to determine whether they yield groups with comparable resource costs. Due to the very large number of categories, the AVG system is relatively complex and would require a good deal of work before it could be used as a payment system for Medicare. There are so many categories with relatively minor boundaries between them that there may be potential for upcoding. Further research is required to investigate the simplification and weighting of the AVG system before it can be determined whether it should be used for either ambulatory surgery or all ambulatory care.

3. Products of Ambulatory Surgery

The PAS system has been developed by the New York State Department of Health as part of the HCFA-sponsored New York State Ambulatory Care Reimbursement Project (see Appendix E). Using a very large data base collected in New York at all hospital-based and freestanding ASCs since 1983, the PAS system currently divides surgical procedures into 42 categories. These categories are defined along two clinically significant dimensions: body systems and type of procedure. The body systems are split into 17 categories that generally correspond with medical specialties such as eye, skin, and urology. Each specialty is then divided up into three types of procedures: diagnostic (e.g., scopes and biopsies), therapeutic (e.g., excisions and incisions), and procedures involving reconstruction and repair. The categories are relatively broad and can be readily translated into either ICD-9 or CPT-4 codes.

The PAS system is still under development, so definitive conclusions about the system are premature. However, based on preliminary Medicaid data, the system appears promising. PAS groups are based on operating room time and on the belief that other resource patterns such as supplies and drugs differ between groups. For example, both lens procedures and skin reconstruction require similar amounts of time, but are bundled into different groups, since the PAS for lens procedures includes prosthetic resources (an artificial lens) costing hundreds of dollars while no similar cost occurs for the skin PAS. After management engineering studies that valued the resources within each PAS category, weights were assigned. Preliminary studies show small to moderate coefficients of variation within each category, thus giving evidence of relatively good homogeneity within groups.

The manageable number of categories and discrete boundaries between the categories make the system administratively feasible and understandable. The categories have the advantage of being relatively difficult to upcode since moving from one category to another requires a significant change in body system or procedure. However, further research exploring the relationship between resource use and reported costs and charges, the variance within the categories, and comparing PAS to other possible systems such as AVGs or DRGs is necessary before we can draw any conclusions about any of the candidate systems. Also, further work to compare OPD with ASC costs and reimbursement rates is necessary to ensure that the reimbursement systems for the two types of ambulatory surgery providers are coordinated and equitable to both OPDs and ASCs.

VI. LEVEL OF PAYMENT RATES

A. Surgery Payment Rates in Different Settings

As noted in Section III, facility costs related to surgery services are reimbursed under four different payment systems depending upon whether the site of surgery is the inpatient hospital, outpatient hospital, ASC, or the physician's office. As a result, the Medicare payment for any given surgery procedure will vary greatly depending upon where the surgery was performed. The existence of four separate reimbursement systems for the provision of surgery services results in a lack of uniformity within the Medicare program. This may lead to inequity since, for any given procedure, providers face different payments and, hence, different incentives in the selection of a delivery site. In fact, some hospitals have installed sophisticated computer programs to identify specific procedures which should be performed on an outpatient basis in order to maximize hospital revenues.

The existence of four payment systems may also lead to inequities in payment since it is not clear whether existing payment differentials reflect actual differences in either the resource cost, patient mix, or quality of care, or whether they are simply an artifact of the existing payment systems.

B. Structure of the Payment Rate

Prospective payment rates can be established in a number of ways. In general, four decisions must be made. The first is choosing the unit of payment, (e.g., CPT-4, ASC payment groups, DRGs, AVGs, PAS). Second, a set of relative prices or weights must be established. Third, a set of adjusters/multipliers must be developed, that is, a method of translating the relative prices into absolute levels of payment, accounting for important hospital and ASC characteristics, (e.g., wage index) that should be reflected in the payment rate. Finally, the system needs to consider how to account for changes both in the relative weights of procedures and in the rate of change in procedures prices.

The first decision is the unit of payment. Considerations of the unit of payment for ambulatory surgery were discussed in a previous section. Essentially, the units of payment under consideration are DRGs, AVGs, PASs, or CPT-4 procedure codes that may be collapsed in some fashion such as in the ASC payment groups. The DRG, AVG, and PAS classification systems are, as described in Section V, methods of aggregating either ICD-9-CM (DRGs, PASs) or CPT-4 procedure codes (AVGs) into clinically meaningful groups that also take into account patient characteristics. As indicated above, the criteria that will be used to choose the unit of payment are administrative simplicity, clinical meaningfulness, and homogeneity within the units of payment.

1. Weights

Regardless of how the unit of payment is selected, a set of relative payment weights would be established. These provide a measure of the costliness or worth of one procedure relative to another. HCFA will be comparing the costliness of hospital procedures to the costliness of the same outpatient surgical procedures at ASCs for two reasons: the Government should provide a "level playing field" for all providers, ultimately allowing difference in payments only for reasons relating to differences in access, quality, and outcomes of care for beneficiaries, and because it wants to pay only the amount necessary to provide access to quality care for its beneficiaries. The current payment system provides OPD payments under a blend of hospital costs and ASC payment rates, as explained earlier.

In addition to costs, other resource measures can also be utilized to develop procedure weights such as charges or resource-based weighting systems. The PAS system being developed by New York State builds up resource costs, focusing on operating room time. However, resource-based weights are difficult to measure and hard to update, so most of the systems being evaluated are based on costs reported by the hospitals and other providers.

A key question is whether the system of weights could be developed into a measure of hospital and ASC surgery case mix complexity that can then be used to explain hospital and ASC surgery costs. A case mix index for each hospital and ASC outpatient surgery case load can be constructed based on the average weight of the procedures it furnishes. A facility which predominantly performs high cost (high weight) procedures, will have a higher case mix (complexity) index than a facility which provides more lower cost (lower weight) procedures. Therefore, a fair payment system would pay relatively more to OPDs with a more "severe" case mix.

Preliminary results of an econometric model developed at The Urban Institute using CPT-4 coded data from hospital outpatient departments provide evidence that the case mix complexity is very strongly related to the costs of providing services in hospital OPDs and that costs are proportional to the case mix (i.e., the elasticity equals 1.0) (see Appendix B for a detailed description of the model).

2. Payment Adjusters/Multipliers

The next decision is the identification and development of the variables required to adjust payments. This requires controlling for many factors in addition to case mix complexity because patient level variables are not in themselves good predictors of resource use. While an analysis of both ASC and hospital outpatient data is needed to determine the appropriate payment adjusters/multipliers, The Urban Institute's analysis of hospital outpatient surgery variations gives us some insight into the variables related to costs. In Table VI-1, we see that in The Urban Institute study, three variables explain 70 percent of the variance in hospital outpatient surgery costs, after trimming extreme cases (i.e., cases that are more than two standard deviations from the geometric mean) from the analysis. This relationship is quite strong and is similar in strength to the relationship found for inpatient surgical costs. The variables included in the analysis are tested here because they have been used for adjusting inpatient payment rates under PPS.

In The Urban Institute study, the case mix index appears to be the single variable most strongly related to costs. The high elasticity of 1.01 shows that aggregate costs are directly proportional to the case mix complexity. The second variable is the hospital wage index, with an elasticity of .62. This means that a 1 percent increase in the wage index results in an average of 0.62 percent increase in OPD surgery costs. It may therefore be important to recognize local wage costs in determining prospective OPD costs, as is done in the PPS hospital inpatient payments. The third significant variable is in a measure of Metropolitan Statistical Area (MSA) or non-MSA status. This measure of urban-rural status is statistically significant but not as important as the previous variables, with an elasticity of 0.08. That is, urban areas perform outpatient surgery less expensively than rural areas, in contrast to inpatient care, where rural areas are less costly.

Other analyses of OPD costs by The Urban Institute looked at the significance of variables used as adjusters for inpatient care in the PPS. Rural referral centers and sole community hospitals have a slight, negative, and insignificant relationship to OPD costs. That is, OPD costs at those kinds of hospitals are slightly less expensive than at other hospitals (see Table VI-1). These results do not contradict our belief that these would not need to become variables used to adjust OPD payments.

Another variable used in the inpatient PPS is a measure of hospitals having a disproportionate share of low income patients. In The Urban Institute study, disproportionate share status has no significant relationship to OPD costs (see Appendix B, Table 3).

3. Updates to Rates

A final consideration in construction of a PPS for ambulatory surgical services is the choice of an appropriate update factor. In determining this update factor, one should take into account price increases for services, cost efficiencies, and the change in the ambulatory surgical care market place.

Table VI-1
Regression Results
Costs of Outpatient Surgery

	(1)	(2)
Intercept	6.17	6.19
	(198.91)	6.19
Case Mix	1.01*	1.01*
	(46.96)	(46.96)
MSA	-0.08*	-0.10*
	(-2.58)	(-2.96)
IR Ratio	0.0002	0.0002
	(0.92)	(1.00)
Rural Referral		-0.05
		(-1.14)
Sole Community		-0.07
		(-1.08)
Wage Index	0.62*	0.61*
	(6.68)	(6.57)
R^2	0.70	0.70
F	568.52	379.60
N	951	951

Significance level: * = 0.01
T values in parentheses

Surgery complexity based on 115 procedures. Dependent variable includes 115 procedures and excludes trimmed observations.

Variables included are chosen because they are used to adjust inpatient PPS.

C. Basis for Calculating Initial Payment Rates

Several options for determining the base for calculating the payment rates for hospital outpatient surgery are possible. Among the considerations in the policy choice are providing hospitals with incentives to deliver services efficiently, budget impact on the Medicare program, and reasonable payment levels to hospitals for the financial soundness of their OPDs.

Basing a prospective rate on the lower of a hospital's costs or charges is problematic because historical cost data may overstate the costs needed for efficient service delivery. Since hospital outpatient costs before FY 1988 were not at all prospective, and hospitals therefore had limited incentives for efficiency, historical costs may overstate the resources required. In addition, since inpatient PPS was implemented, hospitals may have had an incentive to shift costs to the OPD. ASC rates, as shown earlier, are about 30 percent lower than hospital outpatient costs and provide a useful basis of comparison with hospitals. Research underway at The Urban Institute is exploring the relative costs of ASCs and OPDs after controlling for some variables that may explain part of the differences in costs. Other research underway by New York State is evaluating the resources used by OPDs using such measures as operating room time per case. We hope that research using these measures rather than more aggregated cost statistics will provide a clearer picture of resources needed. If further research indicates that resource costs in OPD's are lower than reported costs, as a result of a shift of overhead to the hospital outpatient department after the implementation of PPS, then prospective rates cannot be based solely on information contained in the cost reports.

VII. DATA LIMITATIONS

A. Overview

The research projects funded by HCFA have been utilizing the 1985 hospital OPD "skeleton" file which contains claims for a 5 percent sample of aged and disabled Medicare beneficiaries and a 100 percent sample of end stage renal disease beneficiaries. The file has been supplemented by information from:

- the Hospital Cost Reporting Information System file to calculate costs per claim;
- the 1985 American Hospital Association Annual Survey File and the Master Provider File to obtain more detailed information concerning facility specific and market area characteristics;
- the Health Insurance Skeleton Write Off (HISKEW) file to obtain accurate counts of enrollees in the facility's area;
- the 1985 Part B Medicare Annual Data (BMAD) file to obtain information on other market area characteristics (e.g., average surgery charge per enrollee); and

- Census Department data to obtain information on the characteristics of the general population in the market area (e.g., population).

The resulting data file is a unique and rich source of information useful for the analysis of relevant research topics. However, there remain several data limitations, discussed below, which will be eliminated with the availability of more recent data files.

B. Batch Billing and Unbundling

Some of the observed variation in costs is reflective of 1985 billing conventions. Historically, OPDs were permitted to include in a single claim, services which were provided to a beneficiary over a period of time. Thus, for some of the 1985 claims, costs may reflect only the services delivered on the date of surgery, while other claims include costs provided over a period of time identified by "from" and "through" dates on the bill. This practice is referred to as "batch billing." Analysis of the 1985 bill data has revealed that roughly 17 percent of all 1985 claims were "batch billed," i.e., included costs for services provided over a period of time in excess of one day.

Second, hospitals were not required to include in the surgical bill all services related to the surgery. Thus some bills may include all services related to the surgery, while others may bill for the surgery and related services on separate bills. In addition, hospital OPDs have not been held financially responsible for the provision of all services related to the surgery. For example, prior to implementation of regulations prohibiting unbundling, OPDs could bill for the facility component of a cataract removal/lens insertion procedure, while the physician billed for the intraocular lens prosthesis. Or, alternatively, the OPD might provide both the facility component of the surgery and the intraocular lens prosthesis, but bill for them on separate bills. Thus, the average cost of a lens surgery derived from the 1985 data is based on a mixture of claims which may or may not include the cost of the intraocular lens. Therefore, the cost of a surgery procedure is based on claims with an inconsistent product definition.

C. Inconsistent Coding Conventions

Another limitation of the 1985 hospital OPD file is that it contains ICD-9 procedure codes instead of CPT-4 procedure codes. While the ICD-9 codes are reliable definitions of surgery procedures, they make comparisons between the OPD and ASC setting difficult since the ASCs have always billed under CPT-4 codes. In addition, simulation of the blended rate payment systems is made more cumbersome by the need to convert ICD-9 codes into CPT-4 equivalents before assigning a claim for a given procedure to an ASC flat rate group. It also makes linkage of the professional and technical components of any surgery service difficult since the BMAD file, which contains the physician bill, is also coded in CPT-4 rather than ICD-9.

D. Five Percent Sample

As noted earlier, the 1985 HOP file is based on a 5 percent sample of beneficiaries. While that sample size appears to permit reliable estimates, accuracy could be improved if the universe of claims were available. Analysis of the universe of claims would allow analysis of more of the less frequently performed procedures and would ensure an accurate representation of outpatient facilities performing surgery.

E. Time Period of Data

While 1985 data are not seriously dated, more current data would be preferable. More recent data might also reflect some of the behavioral changes that may have taken place in outpatient facilities since the implementation of the blended payment rate system.

Each of the data limitations discussed above will be rectified through the use of 1987 data, which will incorporate the mandated change to CPT-4 coding, prohibition of unbundling, and the inclusion of 100 percent of claims. In addition, 1987 data will, of course, provide more current cost estimates.

F. ASC Cost Study

The Urban Institute is reviewing ASC cost data obtained from a HCFA survey conducted in 1986 at approximately 500 facilities. The survey gathered information specific to each procedure performed in order to determine a facility's costs in furnishing the procedure. The Urban Institute analysis will attempt to explain variations in the cost of providing surgery services between ASCs and hospital outpatient departments based on the type of services delivered and type of patient treated. The study will also evaluate the relationship between the ASC payment rates and the resources used by ASCs for treatment.

VIII. RECOMMENDATION

Reforming the Medicare program payment system for hospital outpatient surgery is a complex initiative that raises many issues that must be resolved in concert with workable and desirable objectives for an OPD payment system. In this section, we will review the Department's objectives for OPD payment reform, describe and evaluate the proposal by ProPAC for a PPS for outpatient surgery in light of those objectives, and describe HCFA's plans for developing an OPD PPS in the immediate future.

1. The ProPAC Recommendation

ProPAC, in its report to Congress dated April 1, 1989, proposed that HCFA implement a PPS for hospital outpatient surgery beginning October 1, 1989. (A summary of the recommendation is in Appendix A.) The proposal would establish a prospective rate based on a blend of one-third hospital-specific costs, one-third national average hospital costs, and one-third ASC rates for the proposed six ASC groups. Payments would be adjusted to reflect local wage rates. Rates would be set at a level that results in total payments to hospitals equal to current law. Despite the equal total payments to hospitals, Medicare program payments would rise substantially because of a change in the copayment policy. Beneficiary copayments would be reduced from 20 percent of the hospitals' charges to 20 percent of the new Medicare payment rate, which is considerably less. Thus, because the copayments are reduced, the Medicare program payments would increase by an equal amount.

2. The Department's Objectives for Payment Reform and Evaluation of the ProPAC Proposal

The ProPAC proposal should be carefully assessed in terms of basic objectives for any prospective payment system. An outpatient prospective payment system should:

A. Establish incentives for provider efficiency and program cost control while maintaining quality and access to care. A PPS for outpatient care should encourage providers to deliver care more efficiently. A recent study of the effect of PPS on inpatient care has estimated that the inpatient PPS has resulted in savings of roughly 20 percent, which are not offset by increased costs elsewhere in the system.[1] Savings of this size are not anticipated for outpatient care because the length of stay for outpatients is not affected and outpatient care on a per unit basis is less expensive than inpatient care. We do believe that some increases in efficiency under an outpatient PPS are likely and that this is an appropriate goal.[2]

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[1] Russell, Louise B., and Carrie Lynn Manning, "The Effect of Prospective Payment on Medicare Expenditures," New Eng. J. Med. 320:7 (February 16, 1989), pp. 439-443.

B. Budget neutrality. Additional Medicare program outlays should reflect only necessary increases in volume and inflation. However, the ProPAC proposal includes a major reduction of roughly $300 million in the copayments by beneficiaries, and Medicare program outlays would increase by this amount to keep the total payments to hospitals equal.

C. Related to resource use. The system should be largely based on an analysis of resource use by both efficient hospital OPDs and ASCs. The ProPAC proposal is based on the ASC cost categories and is not related to hospital OPD cost groups despite the great importance of hospital OPDs in providing outpatient care. The implicit assumption of ProPAC is that the six proposed ASC groups that identify categories of procedures with similar costs in ASCs also serve to identify groups of procedures with similar costs in hospital OPDs.

However, the ASC groups do not identify groups of procedures with similar costs in the hospital OPD setting. For example, the extracapsular cataract removal cost in a hospital is 79 percent greater than the ASC payment rate, while a bronchoscopy is about 7 percent more, and the average hospital cost for an anesthetic injection is 44 percent less in a hospital than in an ASC under the HCFA proposed six group payment rates (see Table III-1). Even if HCFA established six payment groups in the ambulatory PPS, the procedures included in these groups would be far different if based on hospital OPD rather than ASC costs. Thus, the procedure classes are not uniform in the OPD and ASC settings.

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[2] For a discussion of the limitations of PPS for ambulatory care, see Gold, Marsha, "Common Sense on Extending DRG Concepts to Pay for Ambulatory Care," Inquiry 25:281-289 (Summer 1988)

D. Maintain a "level playing field" among different types of providers for similar services. As a prudent buyer of medical services, Medicare should generally pay the same amount across providers and settings for the same procedures. However, the ProPAC proposal would perpetuate two levels of payment rates for hospitals and for ASCs for similar services.

E. Be clinically meaningful. A patient classification system using clinically meaningful groups will foster acceptance by providers because of the logical relationship between the care given and the payment received. However, the ASC categories used in the ProPAC proposal are based only on historic costs. The payment groups are characterized by a broad mix of various types of procedures, with no clinical consistency or logic within or across groups.

F. Minimize administrative complexity and burden. The payment systems for surgical and other care should be coordinated so that the payment systems are not administratively fragmented. It is confusing and administratively cumbersome for providers, payers, and beneficiaries to have separate payment systems for surgical and nonsurgical ambulatory services provided in the same outpatient setting. Because the ProPAC proposal does not include any provision for nonsurgical ambulatory care, and is based on a typology of ASC approved surgical procedures, prospective payment for medical visits cannot readily be integrated into a cohesive outpatient prospective payment system. The fragmentation of payment systems can hurt hospital management and make provider administration unnecessarily complex.

G. Allow predictability. There are substantial administrative difficulties for all parties involved when a new system is implemented. The hospitals, payers, beneficiaries, and all others involved are required to undertake a great deal of planning and administrative work to implement a new system. If the ProPAC system is implemented, prospects for a more rational and meaningful payment system could be jeopardized because it would be confusing and difficult to implement another new system once developed.

If the ProPAC recommended system was to be implemented, the new system would be sufficiently cumbersome that full implementation could not be expected before October 1990, instead of October 1989. The Secretary is required by law to provide Congress with a proposal for prospective payment for all hospital outpatient services by January 1991. Thus, if the ProPAC proposal was implemented, it would be in place for only 1 year before the onset of more rational and comprehensive payment reform for both surgical and nonsurgical ambulatory services. This rapid shift in payment systems would adversely affect provider planning and flexibility. Also, the shift could adversely impact quality and access to care.

3. Recommendation

The Department, through HCFA, is rapidly moving to develop a comprehensive PPS for all hospital outpatient services, including surgical procedure cases, as required by Congress. The system will build upon the findings and lessons from previous research on AVGs, DRGs, PACs, and other relevant classification systems. When fully developed in January 1991, the Department can present to the Congress a payment system that includes both meaningful surgical procedure and medical case-mix groupings and will be based on appropriate costs of care, while maintaining the incentives for efficiency and high quality care--principles central to any proposal for development and implementation of a prospective system.

Thus, the Department agrees with ProPAC about the desirability of a prospective system. However, by recommending that the system be changed at a single time and as a coordinated whole, the Department goes much further in protecting beneficiaries, providers, and the Medicare Trust Funds.

APPENDIX A:

Medicare Payment for Hospital Outpatient Surgery: The Views of the Prospective Payment Assessment Commission

EXECUTIVE SUMMARY

The Omnibus Budget Reconciliation Act of 1986 (OBRA 1986), Pub. L. 99-509, requires the Secretary of Health and Human Services to develop a prospective payment system for hospital outpatient surgery by October 1, 1989, and a model system for payment of other hospital outpatient services by January 1991. OBRA 1987, Pub. L. 100-203, directs the Secretary to solicit the views of the Prospective Payment Assessment Commission (ProPAC) in developing these policies. This report presents the Commission's recommendations concerning payment for hospital outpatient surgery beginning in fiscal year 1990.

The Commission's recommendations were developed in the context of its longer-term agenda for overall outpatient payment reform. ProPAC recommends an interim approach for payment of hospital outpatient surgery, thereby providing more time to examine this issue under its broader agenda for future outpatient payment initiatives. While this interim approach is not the optimal payment policy for outpatient surgery, it is the most feasible given time constraints, current data deficiencies, and complexities inherent in developing such policy. Further, the Commission believes that its recommendations represent an improvement over current policy and should be adopted until a more comprehensive outpatient payment approach can be developed and implemented.

The Commission recommends that Medicare payment for hospital outpatient surgery be entirely prospective, including capital. The rate for each of the proposed six ambulatory surgery payment groups should be based on an equal blend of hospital-specific costs, a national average rate based on hospital costs, and the rate paid to freestanding ambulatory surgery centers (ASCs). The overall level of the prospective rates should be set so that payments to hospitals for fiscal year 1990 are the same as they would have been under current policy. The rates should be updated annually using a method similar to that for Medicare's inpatient prospective payment system (PPS). In addition, the Commission recommends that legislation be enacted to modify the method for determining beneficiary liability for hospital outpatient surgery.

The remainder of this summary highlights information used by the Commission in its deliberations on hospital outpatient surgery payment policy. It also includes details of ProPAC's recommendations and supporting rationale.

THE EMERGENCE OF OUTPATIENT SURGERY AND SERVICES

Delivery of care in outpatient settings has grown at an unprecedented rate during the 1980s. Advances in medical technology and changes in practice patterns have enabled providers to shift care to alternative settings, including hospital outpatient departments (OPDs) and freestanding ASCs. Constraints on third party payment for inpatient services and expanded coverage in ambulatory settings have also contributed to this growth.

As utilization of inpatient care diminished and hospital occupancy rates declined, hospitals looked to outpatient service delivery as a way to secure their financial viability.

The results of this strategy are confirmed by the rising proportion of hospitals providing outpatient services, especially since 1985. The most dramatic growth occurred with hospitals offering ambulatory surgery. In 1986, almost 87 percent of hospitals provided surgery in the outpatient setting, compared with 65 percent in 1980. Further, the number of freestanding ambulatory surgery centers has risen significantly since 1983, increasing nearly three-fold.

As expected, revenue from outpatient services has become increasingly important to hospitals. Outpatient revenue was about 20 percent of total revenue in 1988, compared with about 12 percent in 1980. Although Medicare is a less dominant payer in the outpatient hospital than in the inpatient setting, the percentage of outpatient revenues from serving Medicare beneficiaries has also increased throughout the 1980s. In 1987, Medicare accounted for about 37 percent of inpatient revenues and 19 percent of outpatient revenues.

Changes in Medicare expenditures reflect greater emphasis on outpatient service delivery and relatively low rates of growth of inpatient spending during the PPS years. Between 1984 and 1987, Medicare inpatient expenditures increased at an average annual rate of about 3 percent, adjusted for inflation, whereas outpatient hospital expenditures increased about 19 percent a year for the same period, adjusted for inflation. As a result, outpatient hospital expenditures grew from about 8 percent of total Medicare expenditures in 1980 to about 12 percent in 1987.

CURRENT MEDICARE PAYMENT POLICY FOR OUTPATIENT SURGERY

Congress recognized the need for greater control of Medicare outpatient expenditures and mandated several modifications to payment for surgery performed in hospital outpatient departments. OBRA 1986 modified payment for certain nonphysician health services provided in connection with some surgical procedures performed in the hospital outpatient department. These are referred to as facility services or the facility payment component. This modification linked hospital payments for outpatient surgery to the prospective method and amounts already established for ASCs.

These changes took effect during hospital cost reporting periods beginning on or after October 1, 1987. Payments to OPDs for surgeries approved for payment in ASCs are based on the lesser of two amounts: (1) reasonable costs or charges; or (2) a blend of reasonable costs or charges and the ASC payment rate. There are currently 4 ASC payment groups; the Health Care Financing Administration (HCFA) proposes to expand these to 6 groups. The ASC payment rates are adjusted for differences in area wages. For the first year, the blended rate equals 75 percent of hospital-specific costs and 25 percent of the ASC payment rate. In the second year and beyond, the blend moves to 50/50. For certain hospitals specializing in eye and ear surgery, the blend is 75 percent of hospital-specific costs and 25 percent of the ASC payment rate until fiscal year 1991, when it moves to 50/50.

RESULTS OF PROPAC ANALYSIS

The difference between OPD costs and the proposed six ASC payment rates is striking. In general, OPD costs per case for surgery exceed both the ASC payment rates and the 50/50 blended rates. Mean ASC payment rates per case are, on average 38 percent less than mean OPD costs per case, ranging from 18 to 48 percent less. The mean 50/50 blended payment rate is 19 percent less than mean OPD costs per case. Aggregate facility costs are greater than both ASC payments and blended rate payments by 31 and 16 percent, respectively.

While OPD costs per case vary by hospital group, differences between costs and payments do not vary substantially. In fact, the difference between OPD costs per case and ASC payment rates is greater than cost/payment differences across hospital groups. Eye and ear specialty hospitals have outpatient surgery costs per case comparable to other acute care hospitals and those in their peer groups. The majority of hospital outpatient department costs for ambulatory surgery are related to cataract procedures.

A CONCEPTUAL FRAMEWORK FOR OUTPATIENT PAYMENT REFORM

In general, a payment system has two components -- the unit of service and the method of payment. The unit of service must be defined before a payment method can be developed. At one extreme, it could be a specific test or procedure. At the other extreme, the unit could be a package of services that includes an entire episode of care. Likewise, a wide variety of payment methods can be employed. The current system employs a fragmented approach for payment of OPD services, embodying an array of payment methods including fee schedules, blended rates, prospective rates, and cost-based reimbursement.

Defining the unit and method of payment is critical to policy design. Yet development of an optimal payment policy for outpatient surgery and other services must also consider potential behavioral responses on the part of all providers in ambulatory settings. Some responses are evident immediately, whereas others occur over time as providers and beneficiaries understand and adjust to the payment system. Medicare payment policy places incentives on providers related to coding, billing, and site of care selection. Likewise, policy can influence beneficiary use of services. The Commission is concerned about the potential consequences of new policies and intends to closely examine these issues as it pursues its agenda for overall outpatient payment reform.

The Commission developed guidelines to evaluate alternative policies in light of the factors it regards as most important. These guidelines reflect an optimal payment approach for both outpatient surgical and nonsurgical services. ProPAC achieved a balance of the system goals in its interim approach for OPD surgery.

The most critical among these guidelines is the need to maintain access to high quality care for Medicare beneficiaries. The Commission believes that the payment system should be clinically neutral and should not provide financial incentives for either patients or physicians in choice of setting. Instead, it should encourage cost-effective care at the lowest reasonable cost, while recognizing justifiable differences in costs of furnishing services. The system should also provide the opportunity for an appropriate level of financial gain and the risk of loss. Further, the system should limit providers' opportunity to influence payment rates through changes in billing and coding practices. Finally, the system should promote administrative ease and predictability while accommodating appropriate changing practice patterns and technological advances.

THE COMMISSION'S RECOMMENDATIONS FOR MEDICARE PAYMENT OF HOSPITAL OUTPATIENT SURGERY

In developing its recommendations on hospital outpatient surgery, the Commission explored several payment issues. Each is complex and interwoven with other decisions. ProPAC developed two major recommendations. The first relates to Medicare payment for hospital outpatient surgery. The second concerns changes in beneficiary liability. Both of these recommendations are also included in the Commission's *Report and Recommendations to the Secretary, U.S. Department of Health and Human Services*, March 1989.

Recommendation 1: Medicare Payment for Hospital Outpatient Surgery

> **Beginning in fiscal year 1990, Medicare payment for the facility component of hospital outpatient surgery, including capital, should be entirely prospective. Separate rates should be established for each of the six groups of surgical procedures proposed for payment of services furnished in freestanding ambulatory surgery centers. The hospital outpatient surgery rates for fiscal year 1990 should be based on a blend of hospital-specific costs, average hospital costs, and the rate paid to ASCs. The average hospital and ASC payment components should reflect differences in area wages.**
>
> **The rate should be updated annually following the approach used under PPS. The overall level of the prospective rates should be set so that the sum of Medicare and beneficiary payments to hospitals would be the same in fiscal year 1990 as they would have been under current policy.**
>
> **These changes in hospital outpatient surgery payment policy should apply to the list of ASC-approved procedures only; the existing Medicare payment provisions should continue for non-list procedures. The Commission recommends eliminating the differential treatment of eye and ear specialty hospitals.**

The Commission recommends that the proposed six ASC payment groups be used to classify ambulatory surgery patients for hospital payment purposes. Payments to hospitals for outpatient surgery should be entirely prospective based on an equal blend of the

Procedures not on the list tend to occur infrequently, are low cost, and may be better treated the same as other outpatient services. Furthermore, procedure-level data are not readily available to determine the payment rates for procedures not on the ASC list.

The Commission recommends that eye and ear specialty hospitals be paid on the same basis as other hospitals. OBRA 1987 provided that payment for ambulatory surgery in certain hospitals specializing in eye and ear surgery be based on a blend of 75 percent hospital-specific costs and 25 percent of the ASC payment rate. ProPAC analysis indicates that eye and ear specialty hospitals have costs comparable to other acute care hospitals and hospitals in their peer groups.

ProPAC acknowledges that eye and ear specialty hospitals may be vulnerable to financial losses for other reasons. These include greater reliance on Medicare outpatient services revenues and more cases in higher loss payment groups. Nevertheless, the Commission believes that these differences should not be accounted for in the payment system. First, ProPAC's recommended payment approach would not result in a major change from current policy for these hospitals. Second, because eye and ear specialty hospitals concentrate a high volume of cases in a few procedures, the Commission believes that they may attain economies of scale which other hospitals cannot achieve.

Finally, the Commission recommends that the Secretary examine the need for improved data from freestanding ambulatory surgery centers. These data, which are extremely limited, are the foundation for establishing the ASC payment groups and rates. Currently, there is no systematic method for collecting information on costs in ASCs. The Commission believes that efforts should be undertaken now to ensure more reliable data from these facilities in the future.

Recommendation 2: Beneficiary Liability for Hospital Outpatient Surgery

> **Beneficiary Part B coinsurance for certain hospital outpatient surgery services should be limited to 20 percent of the payment amount allowed by Medicare. The Medicare program should pay 80 percent of the allowed amount. Currently, beneficiary coinsurance is based on hospital submitted charges, resulting in the beneficiary paying more than 20 percent of the payment amount allowed by Medicare.**

Under current law, beneficiary liability for ambulatory surgery differs depending on the site of care. In hospital outpatient departments, coinsurance is equal to 20 percent of the facility charge. In freestanding ambulatory surgery centers, coinsurance is equal to 20 percent of the ASC payment rate.

Prior to OBRA 1986, hospital outpatient departments were reimbursed on the basis of reasonable costs for all services, including ambulatory surgery. These costs were not determined until after the services were performed. Therefore, it was administratively infeasible to base beneficiary coinsurance on actual Medicare payment. As a result, beneficiary coinsurance was based on submitted charges, which were known when services were performed. Current policy still reimburses hospitals, in part, on a reasonable cost following: hospital-specific costs for each of the six ASC payment groups; national average hospital costs for each of the ASC groups, adjusted for wages; and the proposed ASC payment rates for each of the ASC groups, adjusted for wages. The level of the rates should be adjusted so that the sum of Medicare program payments and related beneficiary cost sharing is the same as estimated under current policy. The rates should be updated annually. Since the rate is entirely prospective, the current payment policy to pay "the lesser of" costs, charges, or the blended rate is unnecessary.

The Commission believes that a prospective rate gives hospitals the opportunity to earn a profit or risk a loss, thereby enhancing incentives to reduce the costs of ambulatory surgery. At the same time, this approach recognizes that many factors potentially contribute to the higher costs of OPDs compared with ASCs. Among them are patient severity, efficiency, maintaining standby capacity, overhead allocation methods, uncompensated care, capacity utilization, teaching activity, billing and coding practices, bundling of services, and regulatory requirements. How these factors affect cost of care is not well understood.

Basing payment partly on hospital-specific cost experience recognizes cost differences across individual hospitals. The average hospital payment portion reflects differences between OPD costs and ASC payment rates. Mean ASC payment rates are now about 38 percent less than mean OPD costs per case. Basing part of the payment on the ASC payment rates places continued financial pressure on hospitals to lower their costs. In summary, the Commission believes that basing payment on these three amounts appropriately recognizes the lower rates paid to ASCs as well as historical cost differences between OPDs and ASCs.

As for controlling expenditures, the overall level of the payment rates for fiscal year 1990 should be adjusted so that total payments to hospitals do not exceed what payments would be under the current 50/50 blended rate. Furthermore, updating the prospective rate annually allows control in the growth of payment per case. Controlling the volume of procedures is a more difficult issue that the Commission intends to study further.

The average hospital and ASC payment components should be adjusted to reflect differences in area wages. Since the hospital-specific component already reflects area wage differences, no adjustment is necessary. ProPAC analysis indicates that the area wage adjustment is effective in narrowing cost/payment differences across hospital groups. Further, analysis by others indicates that area wage differences explain a large share of the variation in hospital outpatient surgery costs. The Commission is not recommending additional adjustments at this time. Further study is necessary to understand factors contributing to cost variations across hospitals.

Capital costs should be included in the hospital-specific and average hospital rates specified above. Currently, hospitals are reimbursed for 50 percent of their actual capital costs related to outpatient surgery under the blended rate method. The ASC rates already include capital. Future payment updates should reflect this capital component.

The recommended changes in hospital outpatient surgery payment policy apply only to the list of ASC-approved procedures. This list captures major surgical procedures.

basis. However, the Commission recommends a prospective payment rate for ambulatory surgery in OPDs. Under this policy, Medicare reimbursement will be known at the time services are furnished. Therefore, it is feasible to follow the general Medicare policy that beneficiary coinsurance equals 20 percent of the payment amount and Medicare payment equals 80 percent.

Analysis conducted by the Commission indicates that, for approved ASC procedures, beneficiary coinsurance tends to be greater in an OPD than in a freestanding ASC. Beneficiary coinsurance in the OPD generally exceeds 20 percent of the payment amount allowed by Medicare. In some cases, the beneficiary is paying more than 35 percent of the amount allowed by Medicare. Therefore, Medicare is reimbursing hospitals less than 80 percent of the allowed amount. In ASCs, however, Medicare pays 80 percent and the beneficiary pays 20 percent of the allowed payment amount.

In the Commission's view, this policy unfairly penalizes the beneficiary that chooses or is forced to seek care in an OPD. In fact, current policy provides a disincentive for the beneficiary to seek outpatient surgical services in an OPD because the coinsurance amount is substantially higher than that of ASCs. ProPAC, therefore, believes legislation should be adopted to eliminate this discriminatory pricing policy and reduce the burden on beneficiaries that use OPD care.

The Commission realizes this policy will increase Medicare expenditures. However, the Commission believes that the Medicare program should assume responsibility for 80 percent of the payment amount. If such an increase in expenditures is unacceptable, there are other less discriminatory ways of reducing Medicare payments.

Several other issues regarding beneficiary coinsurance warrant further examination. These issues relate to different Medicare policies for reimbursing Medicare beneficiary bad debt and waiver of coinsurance. The Commission intends to address these issues in upcoming reports, as warranted.

APPENDIX B:

Econometric Analysis of the Cost of Ambulatory Surgery Among Hospitals by The Urban Institute

I. INTRODUCTION

The purpose of this paper is to analyze why the costs of ambulatory surgical procedures vary amongst hospitals. The costs of ambulatory surgery may vary for a number of reasons. Most importantly, hospitals differ in the range and complexity of surgical procedures that they perform. However, there are many other reasons why costs might vary, even after one controls for casemix complexity. For example, teaching hospitals may be more expensive. Hospitals serving a large share of poor, either Medicaid or nonpaying patients, may bear extra costs. The costs of surgery may decline as the volume of procedures performed increases, or may be higher or lower as the share of hospitals' surgical volume performed on an ambulatory basis increases. Proprietary hospitals may be more efficient and thus have lower costs. Similarly, hospitals having lower inpatient occupancy rates may be less efficient and thus have higher costs, even on the outpatient side. Hospitals that specialize in relatively few procedures rather than providing a wide array of services may also have lower costs.

The degree of competition in the market area for ambulatory surgery may also lead to lower costs. For example, areas with more hospitals or areas where hospitals have extensive competition from HMOs or from proprietary hospitals may have lower costs. Finally, regulation on the inpatient side may affect outpatient costs. For example, the four all-payer rate setting states may have reduced hospital costs in ways that spill over to the outpatient side, even though that component of the hospital's activity is not subject to rate regulation. Finally, costs may be lower in some areas simply due to hospitals' practice patterns which would be reflected in differences amongst regions after controlling for a large set of other variables. In our analysis we attempted to control for these various factors and provide evidence on why the costs of ambulatory surgery varied amongst hospitals in the U.S.

The second purpose of the project is to see whether it is feasible to develop a measure of hospital casemix complexity that could be used as a system of payment. Our analysis is based on 1985 data, thus requiring us to use ICD-9 coding system. We have identified those procedures that are performed most frequently and have developed a system of cost weights for each of 115 frequently performed procedures and weights for each of 4 separate groupings of procedures. A key question is whether the system of weights can be developed into a measure of hospital surgical casemix complexity which can then be used to explain hospital surgery costs. If this casemix complexity measure is statistically significant in a regression equation explaining costs with an elasticity that is approximately equal to one it would demonstrate that the casemix index is proportional to costs and thus could be used as a system of payment. That is, as casemix increases by a given percentage, costs also increase by the same percentage.

This would be evidence then that paying on the basis of the underlying system of weights would yield a fair and equitable payment system without adverse incentive effects. The logic is that if costs rise faster than the casemix index then a system based on the index would tend to underpay for high cost procedures and overpay for low cost procedures. Alternatively, if costs increase more slowly than the casemix index then a system based on the index would tend to overpay for high costs procedures and underpay for low costs procedures.

To examine how well the surgery complexity index is related to hospital costs, we estimated a set of statistical cost functions. The dependent variable is the log of hospital costs for surgical procedure. The principal independent variable is a log of the hospital specific surgery complexity index.

We have estimated two different types of models. The first is a relatively simple model that could be used for policy purposes. We have attempted to replicate to the extent feasible the analysis conducted by Pettengill and Vertrees ("Reliability and Validity in Hospital Case-Mix Measurement," Health Care Financing Review, December 1982). We control for surgery complexity by first constructing a set of cost weights for each procedure and then using these weights to construct a surgery complexity index at the hospital level (described more fully in the following section). One set of variables used in recent hospital Prospective Payment System (PPS) analyses are measures of area size (rural; small metropolitan area, areas with less than 250,000 persons; medium sized metropolitan areas, those with between 250,000 and 1 million persons; and large metropolitan areas, those with more than 1 million persons). Another variable controls for teaching status. We constructed this variable in two ways: (1) as a set of binary variables dividing hospitals into nonteaching, minor teaching and major teaching—COTH—Council of teaching hospitals and (2) as the interns and residents-to-beds ratio as constructed for PPS analyses purposes. We have also controlled for area wages and for whether the hospital has a disproportionate share of low income persons, using the same variables constructed for PPS. We also control for whether the hospital is a sole community provider or a rural referal hospital. Finally, we control for hospital bed size.

The second model we have estimated adds a set of regional binary variables for each of the 9 census regions. The intent is to see whether there are regional effects that are important after controlling for the previously mentioned set of variables. The simple model described thus far would indicate whether Medicare would wish to adjust for teaching, disproportionate share, area size, area wage levels, etc. Regional variables would indicate whether, at least in the initial stages, a payment system should adopt regional variations. Note that our analysis already controls for area size and wage differences; the regional variables would capture any remaining differences. This is clearly another factor which the system would need to incorporate. Regional variations could be allowed in the initial stages and then gradually phased out as has been done with PPS.

We have also estimated a more general model designed to provide a greater understanding of underlying reasons for area differences in the costs of ambulatory surgery. To our basic model we have added the regional variables as above, and variables that reflect the level of hospital surgery volume, the proportion of surgery performed in outpatient settings vis a vis inpatient, the hospital's occupancy rate, the proportion of area Medicare enrollees in HMOs (probably a measure of area health status), and measures of hospital competition, such as hospitals per capita, hospital beds per capita, and the proportion of hospital beds that are proprietary. A set of binary variables indicating ownership, e.g., for-profit, nonprofit, government, has also been included. We have also used two alternative measures of specialization; the first is the ratio of lens procedures to all surgical procedures. The second is a measure constructed similarly to a Herfindahl index that captures the extent to which hospitals specialize in a relatively small set of procedures. We also included a binary variable for whether or not the state was in one of the four PPS waiver states to test the hypothesis that efficiencies forced upon the inpatient service would carry over to the outpatient side as well. Finally, we control for the age, race and sex composition of the elderly population in the area in which the hospital is located.

II. METHODS

This section details the development of the casemix index used in our analysis of outpatient surgery. The methodology used is patterned on the work of Pettingill and Vertrees for the testing of an inpatient casemix using Diagnosis Related Groups (DRGs). The casemix index is an adjustment factor that is intended to be used to explain differences between hospitals that are the result of different populations of patients. To this end, individual surgical procedures are given weights to represent their costs relative to each other. These weights are multiplied by the proportion of each procedure's occurence relative to all procedures in the facility and then summed to produce the casemix index. The overall approach to construction of the surgical casemix can be described as a four step process: selection of procedures, trimming of outliers, assignment of weights, and creation of the casemix index.

The surgical casemix is based on weights for the 115 most common outpatient surgical procedures. The remaining procedures are arrayed by average cost and placed into four groups. The claims data for each procedure is trimmed to exclude outliers and to produce stable procedure weights. These individual procedure weights are multiplied by the proportion that each procedure is performed in the hospital and then added up for the hospital to produce an overall hospital-specific casemix value. This adjustment for the patient casemix can then be used with other variables to help explain the variations in costs amongst hospitals.

A. Selection of Procedures

Our analysis file consists of 54,247 claims from the 1985 Outpatient Skeleton file each represented by a single or paired ICD-9 surgical procedure code. Several of these procedure codes are paired cataract removal/lens insertion codes, which as discussed elsewhere, are treated as a single procedure because of their high frequency, clinical cogency, and unique charge patterns. These 54,247 claims produced 1,498 different single or paired procedure codes. Many of these 1,498 procedures are performed very few times. In order to produce reliable weights based on sufficient data we arbitrarily selected procedures with at least 50 claims. This left us with 115 high volume procedures that represented 86 percent of the total claims. It is for these 115 procedures that individual procedure weights were calculated.

The claims for the remaining 1,383 procedures were arrayed in ascending order by their average cost per procedure, and then grouped into four groups with equal numbers of procedures. We then explored two ways of assigning weights to these four procedure groups. The first was to calculate procedure weights for each procedure and then to take the simple mean of these individual procedure weights to produce a group weight. The second, which was chosen, was to treat all the claims in one procedure group as being for one collapsed procedure, and calculating a weight for this group as was done for the individual procedures. This second method is, in effect, a weighted weight, as it takes into account the number of claims in each of the individual procedures that make up the procedure group. This second method was chosen because it uses more of the data and because it is less susceptible to the effects of procedures with extreme values but very few claims.

Pettingill and Vertrees discuss a method of determining a required sample size to ensure the reliability of the weight. This sample size is a function of the relationship between the variability of the individual claims for a procedure and the overall mean for that procedure. Different levels of confidence of acceptable ranges around the mean can be set, all of which affect the required number of cases. This can be expressed as:

$$S = \left(\frac{z \cdot \sigma}{r \cdot \mu}\right)^2$$

where S = required sample size

z = confidence level statistic

r = acceptable range around the mean

σ = standard deviation

μ = mean

For our trimmed values, all but five of the 115 most numerous procedures had sufficient numbers of claims at 85% confidence of a 15% range around the mean, which would tend to sustain our decision to select procedures with 50 or more claims. At 90% confidence of a 10% range, the values used by Pettingill and Vertrees, only 68 procedures were numerous enough. We have chosen to use a larger data set with more claims to increase the number of procedures on which the hospital casemix index is based. We recognize the loss in the accuracy and reliability of some weights. However, this is a limitation of the 1985 five percent Hospital Outpatient Skeleton file, which is discussed below in the Data section.

B. Trimming of Outliers

In order to produce representative procedure weights it was decided to trim unusually high or low values for each procedure. An extreme value left untrimmed could seriously skew the average cost for a procedure, especially given the relatively small number of claims with which we are working. Several potential trimming methods were explored. Since cost functions often follow log-normal distributions instead of normal distributions, trimming was examined around both the arithmetic and geometric means. Two trimming levels were used on both sets of means: plus or minus two standard deviations, and the more conservative plus or minus three standard deviations.

Each trimming scenario was examined for its impact on the number of claims for each procedure, the arithmetic mean of the costs and the coefficient of variation of the mean cost. Little difference was seen between the arithmetic and geometric models, but there was a noticeable improvement in the coefficient of variation between the two and three standard deviation trims for some procedures. Based on this, it was decided to trim at two standard deviations from the geometric mean. The geometric trim was chosen because it was believed to be more appropriate for the distribution, and because of the precedent of Pettingill and Vertrees. The extra loss in the total number of claims (5 percent vs. 2 percent) due to two standard deviations over three standard deviations was deemed acceptable to produce the decrease in the coefficient of variation.

C. Assignment of Weights

A weight is a value assigned to a procedure that expresses the worth of the procedure relative to all other procedures. For example, in a cost-based weighting system such as this one, a procedure that cost twice as much to perform as the average of all procedures would be assigned a weight of two. This allows comparisons between procedures across hospitals even as the costs per procedure vary.

Put simply, a procedure weight is created by taking the mean value for a procedure (costs or charges) and dividing it by the mean value for all procedures. The value that we have used most frequently in our analyses is the average total costs deflated by the area-wide wage index. The wage index is used to deflate because of the substantial variation in wages across different regions and because wages are a major input factor in hospital costs. Deflating creates costs that are more comparable across areas before aggregating them to produce national averages. Deflation assures that procedures that are more frequently performed in high priced areas do not receive higher weights because of where they are performed.

The majority of the analyses presented here were carried out using weights based on undeflated average total costs. Weights were also calculated for deflated average total charges, and some analyses using those weights were carried out.

Table 1 presents the weights based on wage-indexed trimmed total costs for the 115 procedures with more than 50 claims nationally, and for the four groups that contain the 1383 low volume procedures. The smallest weight is 0.0734 for procedure 38.00, incision of vessel, unspecified site. The largest weight is 2.4376 for 13.50, other extracapsular extraction of lens. The median weight is 0.5541 for procedure 20.01, myringotomy with insertion of tube.

D. Develop Surgery Casemix Index

The Medicare hospital outpatient surgical casemix index is used as an adjustment factor to explain differences between hospital outpatient departments which result from different mixes of services provided. To do this, it must take into account the numbers of the different procedures performed, and the relative values of these procedures to one another.

The surgical casemix index is calculated for each hospital in a two step process. First, for each procedure, the proportion of the hospital's cases for a given procedure is multiplied by the weight for the procedure. Second, these products are summed across the 115 procedures and four procedure groups to produce the hospital surgical casemix index. The construction of the casemix index can be expressed mathematically as:

TABLE 1

Procedure Weights Based on Total Costs

ICD-9 Code	Procedure Name	Weight
38.00	Incision of vessel, unspecified site	0.0734
57.95	Replacement of indwelling urinary catheter	0.1171
86.22	Debridement of wound, infection, or burn	0.1306
57.94	Insertion of indwelling urinary catheter	0.1436
81.92	Injection of therapeutic substance into joint or ligament	0.1488
21.03	Control of epistaxis by cauterization (and packing)	0.1490
86.59	Suture of skin and subcutaneous tissue of other sites	0.1617
81.91	Arthrocentesis	0.1779
86.04	Other incision with drainage of skin and subcutaneous tissue	0.1795
86.51	Replantation of scalp	0.1814
86.23	Removal of nail, nailbed, or nail fold	0.1869
12.73	Cyclocryotherapy	0.1935
08.81	Linear repair of laceration of eyelid or eyebrow	0.1985
54.91	Percutaneous abdominal paracentesis	0.2054
03.91	Injection of anesthetic into spinal canal for analgesia	0.2117
42.92	Dilation of esophagus	0.2121
03.92	Injection of other agent into spinal canal	0.2227
39.95	Hemodialysis	0.2374
48.23	Other proctosigmoidoscopy	0.2383
14.34	Repair of retinal tear by laser photocoagulation	0.2384
05.31	Injection of anesthetic into sympathetic nerve for analgesia	0.2394
12.79	Other glaucoma procedures	0.2425
14.54	Repair of retinal detachment with laser photocoagulation	0.2444
14.24	Destruction of chorioretinal lesion by laser photocoagulation	0.2463
04.81	Injection of anesthetic into peripheral nerve for analgesia	0.2483
58.60	Dilation of urethra	0.2580

Table 1 (continued)

ICD-9 Code	Procedure Name	Weight
86.11	Biopsy of skin and subcutaneous tissue	0.2820
12.12	Other iridotomy	0.3066
41.31	Biopsy of bone marrow	0.3185
34.91	Thoracentesis	0.3372
16.99	Other operations on eyeball	0.3435
42.23	Other esophagoscopy	0.3490
86.09	Other incision of skin and subcutaneous tissue	0.3501
12.59	Other facilitation of intraocular circulation	0.3509
44.13	Other gastroscopy	0.3541
86.30	Other local excision of destruction of lesion or tissue of skin and subcutaneous tissue	0.3691
45.13	Other endoscopy of small intestine through artificial stoma	0.3760
45.24	Other endoscopy of large intestine	0.3765
12.14	Other iridectomy	0.3783
13.64	Discission of secondary membrane (after cataract)	0.3789
45.23	Flexible fiberoptic colonoscopy	0.3953
45.25	Brush biopsy of large intestine	0.4030
13.61	Discission of primary membranous cataract	0.4385
34.40	Excision or destruction of lesion of chest wall	0.4411
57.30	Diagnostic procedures on bladder	0.4432
44.15	Other biopsy of stomach	0.4530
79.02	Closed reduction of fracture without internal fixation, radius and ulna	0.4631
12.54	Trabulectomy ab externo	0.4778
21.32	Local excision of destruction of other lesion of nose	0.4850
45.26	Other biopsy of large intestine	0.4976
38.21	Biopsy of blood vessel	0.5080
45.20	Diagnostic procedures on other intestine	0.5144
27.43	Other excision of lesion or tissue of lip	0.5213
21.30	Excision or destruction of lesion of nose, not otherwise specified	0.5317
18.29	Excision of destruction of other lesion of external ear	0.5351
45.41	Local excission of lesion or tissue of large intestine	0.5429
51.60	Local excision or destruction of bile duct	0.5454

Table 1 (continued)

ICD-9 Code	Procedure Name	Weight
50.90	Other operations on liver	0.5478
20.01	Myringotomy with insertion of tube	0.5541
57.32	Other cystoscopy	0.5578
08.20	Removal of lesion of eyelid, not otherwise specified	0.5603
13.65	Excision of secondary membrane (after cataract)	0.5633
83.39	Excision of lesion of other soft tissue	0.5697
12.64	Trabeculectomy ab externo; scleral fistulization	0.6077
57.93	Control of (postoperative) hemorrhage of bladder	0.6188
60.94	Control of postoperative hemorrhage of prostate	0.6312
11.39	Other excision of pterygium	0.6377
82.01	Exploration of tendon sheath of hand	0.6597
21.31	Local excision or destruction of intranasal lesion	0.6619
86.40	Radical excision of skin lesion	0.6810
33.23	Other bronchoscopy	0.6959
34.81	Excision of lesion or tissue of diaphragm	0.7121
33.22	Fiber-optic bronchoscopy	0.7208
52.91	Endoscopic retrograde cannulation of pancreatic duct	0.7275
08.49	Other repair of entropion or ectropion	0.7305
81.18	Other fusion of toe	0.7600
08.70	Reconstruction of eyelid, not otherwise specified	0.7983
31.42	Laryngoscopy and other tracheoscopy	0.8175
82.21	Excision of lesion of tendon sheath of hand	0.8255
40.11	Biopsy of lymphatic structure	0.8297
60.11	Needle biopsy of prostate	0.8374
64.00	Circumcision	0.8445
04.43	Release of carpal tunnel	0.8926
08.44	Repair of entropion or ectropion with lid reconstruction	0.8952
33.24	Endoscopic bronchial biopsy	0.9031
69.09	Other dilation and curettage	0.9052
85.12	Other biopsy of breast	0.9192
85.21	Local excision of lesion of breast	0.9236
04.07	Other excision or avulsion of cranial and peripheral nerves	0.9533
85.11	Percutaneous (needle) biopsy of breast	1.0409
82.35	Other fasciectomy of hand	1.0778

Table 1 (continued)

ICD-9 Code	Procedure Name	Weight
57.49	Other transurethral excision or destruction of lesion or tissue of bladder	1.1184
53.01	Repair of direct inguinal hernia	1.1509
53.02	Repair of indirect inguinal hernia	1.1575
77.59	Other bunionectomy	1.1872
53.00	Unilateral repair of inguinal hernia, not otherwise specified	1.2472
13.20	Extracapsular extraction of lens by temporal inferior route	1.3716
50.40	Total hepatectomy	1.4334
80.26	Arthroscopy, knee	1.6022
13.69	Other cataract extraction	1.7829
16.23	Biopsy of eyeball and orbit	1.8656
13.72	Secondary insertion of intraocular lens prosthesis	1.9776
13.59	Other extracapsular extraction of lens	2.0489
13.41	Phacoemulsification and aspiration of cataract	2.0564
13.19	Other intracapsular extraction of lens	2.0948
13.19/13.71	13.19 and 13.71 Pair	2.1151
13.70	Insertion of pseudophakis, not otherwise specified	2.1529
13.30	Extracapsular extraction of lens by linear extraction technique	2.1673
13.41/13.71	13.41 and 13.71 Pair	2.1706
13.59/13.71	13.59 and 13.71 Pair	2.1994
13.71	Insertion of intraocular lens prosthesis at time of cataract extraction, one-stage	2.2508
13.69/13.71	13.69 and 13.71 Pair	2.2563
13.20/13.71	13.20 and 13.71 Pair	2.3494
13.30/13.71	13.30 and 13.71 Pair	2.3624
13.50	Other extracapsular extraction of lens	2.4376
Group 1	Procedure Group 1	0.2558
Group 2	Procedure Group 2	0.5762
Group 3	Procedure Group 3	0.9759
Group 4	Procedure Group 4	2.1448

$$\Sigma_i \ (P_{ih} \cdot W_i)$$

where P_{ih} = proportion of claims for procedure i in hospital h

W_i = weight for procedure i

A casemix index has been calculated for each hospital with more than 15 claims. This 15-claim cut-off was used to ensure that an adequate sample size was present for each hospital. The level of 15 claims was chosen arbitrarily. A more extensive method was applied by Pettingill and Vertrees that involves creating a coefficient of variation for the hospital from ten 10% random samples. For their purposes they decided on a minimum sample size of 50 claims from a hospital. The smaller number of claims that we have used may have produced biased surgery casemix indices. However, use of a larger number of claims as a cut-off would seriously reduce the number of hospitals in the analyses we report below; again, this is a problem with the five percent Outpatient sample. The results described below indicate this problem has not been serious.

Table 2 presents the percentiles of the distribution of the surgical casemix for the 1,176 hospitals in our analysis that passed the 15-claim cut-off. The smallest and largest casemixes were 0.1650 and 2.2440, and the median casemix was 1.0097. The mean of the 1,176 hospital casemixes was 1.0351.

TABLE 2

Percentiles of the Surgical Casemix Index

Percentile		Casemix
0	minimum	0.1650
1		0.3884
5		0.4807
10		0.5617
25	1st quartile	0.7293
50	median	1.0097
75	3rd quartile	1.2688
90		1.5575
95		1.7561
99		2.0633
100	maximum	2.2440

N = 1176
mean = 1.0351

III. DATA

The file for this analysis is a rich data set that contains information from several different sources including HCFA's Hospital Skeleton File, Hospital Cost Reporting Information System File (HCRIS), Master Provider File, Hospital Insurance Skeleton Eligibility Write-off File (HISKEW), Adjusted Area Per Capita Cost File (AAPCC), and a Wage Index File, Census Data, and the American Hospital Association's Annual Survey File. These data files are discussed below and are followed by a description of the variables used in the analyses.

A. Data Sources

The 1985 Hospital Outpatient Skeleton File contains all the outpatient claims for 1985 from a five percent sample of all aged and disabled Medicare beneficiaries and a 100% sample of all ESRD program beneficiaries. For this analysis we are using the claims from this file for aged beneficiaries who had a single surgical procedure or one of the common pairs of surgical procedures. By merging back with the full 1985 Hospital Outpatient File we have both ICD-9 procedure codes and charge information for each claim. This file was used to create the dependent measure which is the average cost per surgical procedure in an outpatient department; the main independent measure which is the surgical casemix index; and two other independent variables, the surgical specialization index and the proportion lens procedures.

The HCRIS data set is maintained by HCFA and contains charge-to-cost information from hospital cost reports (HCFA Form 2552) which permit us to convert charges to costs. We have used the HCRIS Ambulatory Surgery Center (ASC) File which was derived from the HCRIS PPS II minimum data set. The HCRIS ASC File contains information for 6,333 providers. The HCRIS also contains such descriptive information about the hospitals as their census region, bedsize, ownership, and status as a rural referral or sole community facility.

The Master Provider File is a HCFA data set containing descriptive information on all Medicare eligible facilities. The variables of interest to our analysis are disproportionate share, interns and residents to beds ratio, and location in a PPS waiver state.

The HISKEW is a HCFA data set that contains information on beneficiary eligibility. From this we have determined the total number of Medicare enrollees in an area and their composition by age, race and sex.

The AAPCC is a HCFA payment data set from which we were able to measure the number of Medicare enrollees participating in Health Maintenance Organizations (HMOs) in an area.

HCFA annually computes wage indices for each metropolitan area and for each state's non-metropolitan area. This information was merged with the Master Provider File to associate an area wage index with each hospital.

Data from the U.S. Census was aggregated to the MSA and state non-MSA level to create population denominators for the number of hospital beds and the number of hospitals per capita.

The AHA annually collects information on the characteristics of all United States hospitals. This includes such information as the hospital's geographic location, bedsize, and patient volume.

B. Variable Construction

Average Costs - LCOST

The natural logarithm of the average cost per outpatient surgical procedure in a hospital serves as the dependent measure in our analyses. The average cost is derived from the charges which are on the Outpatient Skeleton File and the cost-to-charge ratios on the HCRIS File. Charges can be generated for up to twenty-eight different revenue centers within a hospital. Hence, there are separate charges for the components of a visit, e.g., operating room, laboratory tests, drugs. Up to eight of these revenue center charges are reported individually, and a total of all revenue center charges is also reported. HCRIS cost-to-charge ratios are available for all twenty-eight revenue centers in each hospital, and for the hospital as a whole. We have found that the sum of the eight revenue centers equals or is within 1 percent of the total charges only 84 percent of the time. Because of the lack of agreement between the sum of the eight revenue centers and the total of all revenue centers it was decided to develop the total costs per claim directly from the total of the charges on each claim multiplied by the facility-specific cost-to-charge ratio from the HCRIS File. These costs per claim are then summed by hospital and divided by the number of claims in the hospital to get an average cost per procedure for each hospital.

Outpatient Surgical Casemix Index - LITOTCST

The hospital's outpatient surgical casemix index is the main independent variable. It is developed using cost data from the surgical claims on the Outpatient Skeleton File. Its construction, which is explained in detail in the Methods section above, is a four step process: selection of procedures, trimming of outliers, assignment of weights, and creation of the casemix index.

Surgical procedures with more than 50 claims each had individual weights calculated. The weight for a procedure is calculated by taking the trimmed wage deflated average cost for the procedure in all hospitals and dividing it by the wage deflated average cost for all procedures in all hospitals. The remaining low volume procedures were collapsed into four groups with equal numbers of procedures which then had group weights calculated. A casemix value was calculated for each hospital by multiplying the proportion of each individual procedure's occurrence relative to all procedures in the facility by the procedure's weight and summing this across all 115 procedures and the four procedure groups.

Disproportionate Share – LDSP

The disproportionate share is a measure of the burden of low income patients on a hospital. This variable is from the Master Provider File and is calculated by HCFA by dividing the number of inpatient days attributable to Supplemental Security Income (SSI) beneficiaries by the sum of Medicare and Medicaid patient days and then dividing by the total number of patient days. When the natural logarithm was taken of this variable, zero values were replaced with $1X10^{-6}$ to prevent the creation of missing values.

Metropolitan Statistical Area Size – MMSAS12, MMSAS34, MMSAS56

Three binary variables were created to represent the size of the metropolitan area in which each hospital is located. This was done using information from the AHA's Annual Hospital file. The populations in these areas are: MMSAS12, less than 250,000; MMSAS34, 250,000 to 1,000,000; MMSAS56, greater than 1,000,000. The reference category used in the regressions is rural, or non-MSA.

Interns and Residents to Beds Ratio – LBDRATIO

The ratio of full-time equivalent interns and residents to the number of beds in a hospital is used by HCFA as a proxy for the indirect costs of medical education. This information is gathered by HCFA and is available on the Master Provider File. For analysis, the the natural logarithm was taken of this variable with zero values replaced by $1X10^{-6}$ to prevent the creation of missing values.

Rural Referral Hospital - RUREFB

This binary variable from the HCRIS File indicates whether the hospital is a rural facility that serves as a referral center. Under PPS, hospitals that meet this definition are reimbursed at the urban rather than the rural rate. To be considered a referral facility the hospital must be in a rural area and have more than 500 beds, or it must have at least half of its Medicare patients referred from other hospitals and non-staff physicians, or at least 60% of its Medicare patients must live more than 25 miles from the hospital.

Bed Size - LBEDSIZ

The natural logarithm of the number of beds in the hospital. This data is from the HCRIS File, and missing or extreme values of this variable were cross-checked with the AHA file and corrected.

Sole Community Hospital - SOLECOMB

The sole community hospital binary variable is taken from the HCRIS File and indicates whether the hospital, which is the only one serving a geographic area due to geography, admitting patterns, or weather, chooses to be designated as the sole community facility. Under PPS, these hospitals are recognized for the special role they play and are reimbursed by a rate that is blended between the regional rate and the hospital-specific rate.

Wage Index - LWAGINDX

The natural logarithm of the area wage index. Calculated by HCFA for each MSA and for the non-MSA region of each state. Wages, which are a major component of hospital costs, vary substantially across regions. The wage index was used to deflate costs in creating procedure weights for the casemix index, and here is used as a separate independent variable.

Census Region - REG1, REG2, REG3, REG4, REG5, REG6, REG7, REG8, REG9

The location of the hospital according to the nine Census Bureau regions is taken from the HCRIS File. The nine regions are, in order: New England, Mid-Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific. In the regressions, the Pacific region (REG9) is the excluded reference region.

PPS Waiver Status - WAIVER

This binary variable from the Master Provider File is used to identify hospitals in the four states that in 1985 were not participating in PPS for inpatient hospital care. These states were: Maryland, Massachusetts, New Jersey, and New York, each of which have imposed strict market regulation on the hospital industry.

Total Outpatient Visits - LVTOT

The total number of outpatient visits for the hospital is used as a volume measure to examine economies of scale. The variable, of which we use the natural logarithm, is taken from the AHA file.

Ambulatory Surgical Visits - LSURPAMB

The total number of ambulatory surgical operations in each hospital is used as a volume measure to examine economies of scale. The variable, of which we use the natural logarithm, is taken from the AHA hospital file.

Ambulatory Surgical Ratio - LDIV_AMB

The proportion of surgical procedures in the entire hospital which are performed as outpatient procedures. This is derived by dividing the number of ambulatory surgical operations by the total number of surgical operations in the hospital. Both of these variables are available from the AHA hospital file. The natural logarithm is taken of this variable for use in the regressions.

Proportion of Medicare Enrollees in HMOs - LDIV_HMO

The proportion of Medicare enrollees in HMOs for an area is derived by dividing the number of Medicare enrollees in HMOs in an area by the total number of Medicare enrollees in the area. The number of enrollees is from the HISKEW file, while their participation in HMOs is from the AAPCC file. The natural logarithm is taken of this variable for use in the regressions.

Occupancy Rate - LDIV_ADC

The hospital's inpatient occupancy rate is defined as the average daily hospital census divided by the number of statistical beds in the hospital. This is calculated using these two variables from the AHA data file. The natural logarithm is taken of this variable.

Hospital Beds per Capita - LBEDS85

The number of hospital beds per person in an MSA or rural area of a state is entered as a measure of the availability of services and of the competitive pressures in an area. The population of an area is from the Census while the number of hospital beds from the AHA. The natural logarithm is taken of this variable for use in the analysis.

Hospitals per Capita - LHOSP85

The number of hospitals per person in an MSA or rural area of a state is entered as a measure of the availability of services and of the competitive pressures in an area. The population of an area is from the Census while the number of hospital in an area is from the AHA. The natural logarithm is taken of this variable for use in the analysis.

Proportion of Private Beds - LPRVPT85

The proportion of beds in an MSA or rural area of a state that are in private, proprietary hospitals. This is used as a measure of the competitive forces in an area. This is calculated using bed size and ownership information from the AHA data file. When the natural logarithm was taken of this variable, zero values were replaced with $1X10^{-6}$ to prevent the creation of missing values

Demographic Variables - LAG2RT85, LAG3RT85, LAG4RT85, LMALRT85, LNWTRT85

These variables represent the proportion of the Medicare enrollees in an MSA or rural area of a state that are in these demographic categories. This will help control for differences in the population in each area. The information has been developed at the MSA level from the HISKEW file. The natural logarithm is taken for each of these variables. The categories are:

LAG2RT85 - Age 65 to 74

LAG3RT85 - Age 75 to 84

LAG4RT85 - Age 85 and Over

LMALRT85 - Male

LNWTRT85 - Non-White

The proportion of enrollees under age 65 is used as the reference category for the age variables.

Surgical Specialization Index - LSINDX

The surgical specialization index is a measure of breadth of outpatient surgical procedures performed by a hospital. It is calculated in a manner similar to that of the Herfindahl index. Using the 115 procedures that we have identified as each having more than 50 claims on the Outpatient Skeleton File, the specialization index is the sum across all 115 procedures of the square of the proportion of all claims that are for a specific procedure. This can be expressed as:

$$\Sigma_i \left(\frac{n_i}{N} \right)^2$$

where n_i = number of claims for procedure i in the facility

N = total number of claims for the 115 procedures in the facility

Thus, a facility that performs a few cases each of many different procedures will have a very small specialization index and a facility that only performs one type of procedure will have the maximum specialization index of one. Some facilities performed none of the 115 most common procedures. They were assigned a specialization index of zero which became a missing value when the natural logarithm was taken of this variable for use in the analysis.

Proportion Lens Procedures - LPLENS

The proportion lens procedures is another specialization index that measures the concentration of ambulatory services in the hospital that are ophthalmologic procedures. It is created for each facility by taking the number of claims from the Outpatient Skeleton File that were for procedure 13.71, one-stage insertion of intraocular lens prosthesis at time of cataract extraction, including claims that were for procedure 13.71 paired with another ophthalmologic procedure, and dividing by the total number of claims in the facility. When the natural logarithm was taken of this variable, zero values were replaced with $1X10^{-6}$ to prevent the creation of missing values.

Hospital Ownership - PROPR, PUBGOV

The type of control variable on the HCRIS File provides us with three levels of hospital ownership for each hospital: proprietary, public government, and non-profit. Two binary variables were created denoting the proprietary and public hospitals, and the non-profit hospitals were used as the reference category.

IV. RESULTS

We tested the validity of the casemix index by using the hospital-specific surgery complexity measure in a set of regression equations. As described in Section I, we estimated three types of models incrementally increasing numbers of observations. Each model attempts to explain variations in hospital costs per surgical procedure. The simple model includes the surgery complexity index and controls for the disproportionate share of poor persons, location of the hospital—three categories of MSA size, the intern-resident ratio (a measure of teaching hospital status), the size of the hospital, e.g., number of beds, and binary variables indicating whether the hospital is a rural referral hospital or a sole community hospital.

Four versions of the simple model were estimated. The first used the surgery complexity index based on the 115 most frequently performed procedures. The remaining procedures were excluded from the analysis. The dependent variable, hospital cost per surgical procedure, also included only claims for these 115 procedures. In addition, it excluded all trimmed observations. In the second version of the simple model, the surgery complexity index was also based on 115 procedures, but the dependent variable included not only the 115 procedures but also the trimmed observations. In the third version of the simple model, the surgery complexity index was based on all procedures. The 115 procedures were joined by all remaining procedures which were grouped into four classes, weights were developed for each of the classes, and these weights were used in construction of the hospital-specific surgery complexity index. The dependent variable includes all cases. Each of these three models results in the addition of more hospitals to the analysis. In the fourth and final version of the simple model, the surgery complexity index is based on total charges rather than costs. Otherwise, the model is comparable to the third model.

The results of the simple model are presented in Table 3. In equation (1) the surgery casemix index is highly significant. The t-value is 47.51. The elasticity of hospital surgery costs with respect to the casemix index is 1.00, indicating that costs are almost perfectly proportional to casemix. The wage index is also strongly significant with an elasticity of 0.55. This indicates that a 1 percent increase in the wage index results in a 0.55 percent increase in hospital surgery costs. This is a somewhat lower elasticity than has been observed for inpatient costs and may be due to the fact that labor is a smaller share of outpatient surgery costs than it is for inpatient care (1). The teaching hospital variable is also significant but has a fairly small impact on

TABLE 3

Regression Results
Costs of Outpatient Surgery: Basic Models
(t-values in parentheses)

	(1)	(2)	(3)	(4)
Intercept	6.70 *** (63.36)	6.54 *** (55.19)	6.50 *** (60.25)	6.46 *** (60.00)
Surgery Complexity	1.00 *** (47.51)	0.98 *** (41.34)	1.04 *** (43.82)	1.03 *** (44.34)
Disproportionate Share	−0.001 (−0.22)	−0.001 (−0.22)	−0.002 (−0.83)	−0.002 (−0.88)
MSA (1)	−0.04 (−0.94)	−0.04 (−0.83)	−0.02 (−0.67)	−0.02 (−0.58)
MSA (2)	−0.06 * (−1.64)	−0.07 (−1.61)	−0.06 * (−1.65)	−0.06 (−1.60)
MSA (3)	−0.02 (−0.57)	−0.03 (−0.51)	−0.01 (−0.35)	−0.02 (−0.45)
IR Ratio	0.01 *** (2.92)	0.01 *** (2.44)	0.005 *** (2.33)	0.004 *** (2.08)
Bed Size	−0.10 *** (−5.52)	−0.07 *** (−3.82)	−0.08 *** (−4.28)	0.07 *** (−3.91)
Rural Referral	−0.02 (−0.48)	−0.01 (−0.28)	−0.02 (−0.43)	−0.02 (−0.46)
Sole Community	−0.09 (−1.41)	−0.07 (−1.01)	−.001 (0.02)	0.004 (0.07)
Wage Index	0.55 *** (5.11)	0.57 *** (4.73)	0.57 *** (5.39)	0.54 *** (5.07)
R^2	0.72	0.64	0.63	0.64
F	238.27	179.81	202.81	206.45
N	951	1000	1171	1173

Significance levels: * < 0.10; ** < 0.05; *** < 0.01

(1) Surgery complexity based on 115 procedures; dependent variable includes only 115 procedures and excludes all trimmed observations.

(2) Surgery complexity based on 115 procedures; dependent variable incluudes only 115 procedures but includes trimmed observations.

(3) Surgery complexity based on 115 procedures with remaining procedures grouped into 4 classes; dependent variable includes all cases.

(4) Surgery complexity based on charges rather than costs; otherwise same as model (3).

costs. The size of the hospital is inversely related to surgery costs; that is, larger hospitals have lower costs than smaller ones, ceteris paribus. The elasticity is 0.10 meaning that a 1 percent increase in hospital beds results in a 0.10 percent reduction in surgery costs. The disproportionate share, rural referral, and sole community hospital variables were all insignificant. Binary variables comparing MSAs to rural hospitals all had negative signs and only the medium category of MSAs, those with between 250,000 and 1 million persons, was significant. Even this variable was only barely significant at the 0.10 level. The R^2 for this model is 0.72, comparable to that of analyses of hospital inpatient costs.

In equation (2) we added the trimmed observations to the dependent variable, that is, those with extremely high or low costs per discharge. As expected, the R^2 declined to 0.64. The elasticity on the surgery complexity index declined slightly to 0.98 but still remained approximately proportional to cost and remained highly significant (t-value = 41.34). The wage index, hospital size, and teaching ratio all remained significant.

In the third equation, we added the four residual categories for all remaining (1383) procedures. These procedures, as have been described above, accounted for about 14 percent of all claims. These have been grouped into four categories. The four sets of group procedures are used in the construction of the casemix index and their claims are used in the construction of the dependent variable. The results are shown in equation (3). The casemix index remains highly significant with an elasticity of 1.04 (t-value = 43.82). The wage index remains highly significant with an elasticity of 0.57. The hospital bed size and teaching ratio variables were again significant with the same signs. The mid-sized MSA variable also remained significant and negatively related to cost. Other variables remained insignificant. The R^2 declined to 0.63, still quite high.

Equation (4) shows a similar regression but with the surgery complexity index constructed based on charges rather than costs. The elasticity on the casemix index declines slightly to 1.03 and the variable remains highly significant (t-value = 44.34). The wage index and bed size variables remain highly significant with the same signs. The negative finding on the mid-size MSA variable becomes insignificant. The R^2 increases slightly to 0.64.

In the next set of regressions (Table 4) we add other explanatory variables to the basic model. In equation (5) a set of regional binary variables have been added. The results allow comparisons with outpatient surgery costs in the Pacific region, all other variables held constant. Surgery costs appear to be higher in the New England, West North Central, and East South Central and lower in the South Atlantic, East South Central, and Mountain regions. That is, when we control for all other variables in the regression, there remain important regional effects. For example, relative to the Pacific region, surgery costs in New England, the West North Central, and the East South Central regions are approximately 10 percent, 11 percent, and 9 percent higher, respectively. On the other hand, costs in the South Atlantic, West South Central, and Mountain regions are approximately 13 percent, 13 percent, and 20 percent lower. Adding the regional variables has little effect on other variables in the model. The two exceptions are that the mid-sized MSA variable and the teaching variable become insignificant.

In equations (6) and (7), we add a number of other variables to the model. These include measures of rate regulation, e.g., whether or not the hospital was in a state on the PPS system or in a waiver state, the volume of outpatient visits, the volume of outpatient surgery, the proportion of all surgery in the hospital that is done on an ambulatory basis, and the hospital's occupancy rates. Next we control for the proportion of the area Medicare enrollees who

TABLE 4

Regression Results - Cost of Outpatient Surgery: General Models
(t-values in parentheses)

	(5)	(6)	(7)
Intercept	6.42 *** (57.86)	6.11 *** (8.19)	6.12 *** (7.69)
Surgery Complexity	1.07 *** (44.85)	1.08 *** (40.52)	1.07 *** (37.57)
Disproportionate Share	-0.000 (-0.02)	0.001 (0.72)	0.003 (1.24)
MSA (1)	-0.01 (-0.42)	-0.04 (-0.87)	-0.05 (-1.06)
MSA (2)	-0.03 (-0.94)	-0.05 (-1.08)	-0.06 (-1.40)
MSA (3)	0.003 (0.07)	-0.01 (-0.20)	-0.03 (-0.49)
IR RATIO	0.002 (1.27)	0.000 (0.09)	0.000 (0.16)
BEDSIZE	-0.07 *** (-3.86)	-0.08 *** (-2.85)	-0.10 *** (-3.30)
RURAL REFERRAL	-0.01 (-0.22)	-0.01 (-0.33)	-0.01 (-0.16)
SOLE COMMUNITY	0.01 (0.18)	0.001 (0.01)	0.002 (0.03)
WAGE INDEX	0.51 *** (4.47)	0.51 *** (3.71)	0.48 *** (3.23)
NEW ENGLAND	0.10 ** (2.06)	0.09 (1.47)	0.05 (0.73)
MIDDLE ATLANTIC	-0.004 (-0.08)	0.02 (0.28)	0.03 (0.50)
EAST NORTH CENTRAL	0.003 (0.06)	0.53 (0.94)	0.05 (0.81)
WEST NORTH CENTRAL	0.11 ** (2.35)	0.07 (1.41)	0.07 (1.22)
SOUTH ATLANTIC	-0.13 ** (-2.14)	-0.07 (-1.00)	-0.08 (-1.06)
EAST SOUTH CENTRAL	0.09 * (1.72)	0.03 (0.47)	0.003 (0.06)
WEST SOUTH CENTRAL	-0.13 ** (-2.18)	-0.10 (-1.55)	-0.07 (-0.98)
MOUNTAIN	-0.20 *** (-3.64)	-0.17 *** (-2.96)	-0.20 *** (-3.17)
WAIVER		-0.06 ** (-2.00)	-0.05 (-1.39)
OUTPATIENT VISITS		0.004 (0.45)	0.004 (0.55)
SURGERY VOLUME		0.03 (1.60)	0.04 * (1.69)
$\frac{\text{AMBULATORY SURGERY}}{\text{ALL SURGERY}}$		-0.03 (-0.82)	-0.03 (-0.77)
$\frac{\text{HMO ENROLLEES}}{\text{ALL ENROLLEES}}$		0.01 (1.17)	0.01 (1.53)
OCCUPANCY RATE		-0.12 ** (-2.32)	-0.10 * (-1.82)
BEDS PER CAPITA		-0.09 * (-1.74)	-0.05 (-1.02)
HOSPITALS PER CAPITA		0.07 (1.62)	0.05 (1.03)
PROPRIETARY SHARE		-0.01 ** (-2.41)	-0.01 ** (-2.07)
PCT LENS		-0.003 ** (-1.97)	--
SPECIALIZATION		--	-0.04 * (-1.66)
PROPRIETARY		-0.11 *** (-3.72)	-0.11 *** (-3.30)
PUBLIC		-0.01 * (-1.64)	-0.07 (-1.49)
$\bar{R}^2$	.66	.68	.67
F	127.01	69.54	57.20
N	1171	1171	999

Significance levels: * < 0.10; ** < 0.05; *** < 0.01

join HMOs. Three measures of competition are introduced: the ratio of hospital beds per capita, the number of hospitals per capita, and the proportion of hospital beds that are in proprietary hospitals. Then, we control for ownership of the hospital—proprietary, public or nonprofit. We also introduce two measures of hospital specialization. The first, used in equation (6), is the proportion of the volume at the individual hospital that is lens procedures. In equation (7) we construct a specialization index similar to a Herfindahl index (described in the previous section). Finally, a set of demographic characteristics—the age, race, and sex composition of the Medicare population—are included.

The results of interest in equation (6) are as follows: Outpatient surgery costs in waiver states were 6 percent lower than in PPS states, holding all else constant. This suggests perhaps that hospitals in rate-setting states have become more efficient, even in the provision of services on an outpatient basis. Alternatively, it may suggest that costs have become higher in PPS states because of a possible shift of more surgery to outpatient settings. The hospital's occupancy rate is negatively related to surgery costs. While this variable is measured for inpatient care, it may serve as a measure of capacity utilization for the outpatient side as well.

Two of the measures of competition were significant. Hospital beds per capita and the proportion of hospital beds in proprietary hospitals were significantly related to surgery costs. Both variables had the expected negative sign. The binary variables indicating the ownership of the hospital were also both significant. Proprietary hospitals were negatively related to hospital costs per surgical procedure. The coefficient indicated that proprietary hospitals were approximately 11 percent less expensive, all else held constant. Surprisingly, public-owned hospitals were 1 percent less expensive, though this variable was only significant at the 0.10 level.

The ratio of lens procedures to all surgical volume was also significant and negatively related to surgical costs. That is, the more the hospital specializes in lens procedures the lower its cost per procedure after controlling for complexity and a wide range of other variables. None of the other variables in the model were significant.

The R^2 increases from 0.63 to 0.68 with the addition of these other variables. The addition of these other variables has no substantial effect on the other variables in the model with two exceptions. The surgery complexity index increases slightly and none of the regional variables other than the Mountain region remain statistically significant.

Equation (7) substitutes the specialization index for the lens variable. The specialization index is negative and significant as expected, but is only significant at the 0.10 level. The other variables have similar signs and most remain significant. Important exceptions are the waiver variable, which while remaining negative is no longer significant, and the hospital beds per capita variable. The volume of ambulatory surgery becomes significant at the 0.10 level and is positively related to hospital costs.

In summary, the most important findings from the complete model are that the surgery complexity index is highly significant and strongly related to hospital costs. The elasticity is slightly above 1.0, indicating that costs increase roughly in proportion to casemix. Hospital costs appear to increase with area wages and to decline with hospital size. Variables such as disproportionate share, community size, etc. that have been found to be significant in inpatient settings are not important in affecting outpatient surgery costs. There appear to be important regional effects, but these disappear when a set of other possible explanatory variables are introduced. The most important of these additional variables are hospital occupancy rates, competition from proprietary hospitals and among hospitals in general, proprietary ownership of the hospital, and specialization in lens procedures or in a relatively small set of surgical procedures. All of these factors are associated with lower surgery costs.

V. IMPLICATIONS

These results strongly suggest that a prospective payment system based on ICD-9 codes could be developed. The finding that the surgery complexity index was a highly significant variable in the regression analysis, with an elasticity of approximately 1.00 implies that hospital surgery costs increase in proportion to casemix complexity. The implication is that a set of weights based on ICD-9 codes could be used to develop a system of payment; that is, payment rates for different services would increase or decrease in proportion to average hospital costs of providing them.

As stated above, however, the analysis was based on ICD-9 code. While clinically meaningful and administratively simple, there are at least two major problems with the use of ICD-9 codes as the unit of payment. First, there are probably too many codes, a factor which may invite upcoding by hospitals. Second, hospitals were required to use CPT-4 codes for billing purposes beginning in July 1987. Because of the similarity between ICD-9 and CPT-4 codes for surgical procedures, however, these results suggest that a prospective payment system could also be developed based on CPT-4 codes. Further research is needed to indicate how CPT-4 codes could be collapsed into fewer, yet meaningful categories. The validity of a casemix system based on CPT-4 codes would then have to be tested. Our results, however, provide reason for optimism.

The advantages of ICD-9 or CPT-4 codes are first that the coefficients of variation are likely to be relatively small because of the nature of outpatient surgery. Second, even use of CPT-4 codes would yield relatively few procedures, and collapsing in meaningful ways would reduce the number even further. Ambulatory Visit Groups (AVGs) might provide an approach which would yield even fewer codes. Whether AVGs would be preferable would depend on whether the reduction in the number of payment units offsets the likely higher coefficients of variation, and the reduced explanatory power in the type of regression analysis that we have conducted.

The system of payment would use the weight times a multiplier as the prospective rate for each procedure. The regression analysis that has been conducted controlled for many factors in addition to casemix complexity. The regression equation could, in principal, be used to establish a basic budget neutral multiplier, that is the national average cost per case. Alternative approaches might also be considered. For example, if it is believed that outpatient departments are not efficient in delivery of ambulatory surgery, the use of other data could be used. Two alternatives would be the use of operating room time or other non-cost, non-charge data, e.g., as with the New York State Products of Ambulatory Surgery (PAS) system. An alternative approach would be to use ambulatory surgery center rates either in full or in part.

The basic multiplier should be adjusted for individual circumstances beyond the control of the hospital. The regression analysis indicates that several other factors are important in explaining variations in hospital outpatient department surgical costs. Some of these merit recognition in a prospective payment system for outpatient surgery; others do not. For example, the results indicate that area wages are significantly related to surgical costs. Thus, it would be important to recognize area wage differences as is currently done in the hospital inpatient PPS system. The results also indicate that hospital size is inversely related to surgery costs, meaning that large hospitals have lower costs than smaller hospitals. A system that did not recognize this factor would tend to overpay large hospitals and underpay small hospitals. Policymakers may or may not wish to take this finding into consideration.

We also found evidence that some regions had higher costs than others; not recognizing regional differences would mean that some would be losers, and others gainers. But we also found that these regional differences were associated with other factors such as hospital occupancy rates and ownership. Since these factors are unlikely to be included in a payment system, high occupancy and nonprofit hospitals would tend to be losers and low occupancy and proprietary hospitals winners.

We also found that hospitals had lower costs the more they specialized in a limited number of procedures. Failure to incorporate this kind of adjustment into the prospective payment system would result in underpaying hospitals which provide a wide range of surgical procedures, thereby discouraging possible shifts from inpatient to outpatient settings. Moreover, the system would be quite profitable to those who do specialize. Finally, there was some evidence that surgery costs were lower in more competitive markets and in areas with hospital inpatient rate setting. Ignoring these factors would reward hospitals in those areas, a policy which does not seem inappropriate.

Glossary

Elasticity - The relative response of one variable to a small percentage change in another variable (how much Y changes when X changes by a certain percent). Elasticities closer to 1 indicate higher relative degrees of responsiveness or sensitivity between the two variables and elasticities closer to zero describe variables which are relatively unresponsive or 'insensitive' to each other.

Statistical Cost Function - Statistical cost functions are mathematical expressions of the dollar costs of 'producing' particular outputs. For example, if a surgical procedure is taken as an individual output, in order for that procedure to be 'produced' a net cost is incurred by a provider (i.e. hospital). The hospital pays nurses, buys pharmaceuticals, pays insurance premiums, etc, in order to 'produce' a surgical procedure. When expressed together, all of these individual factor costs represent a statistical cost function.

Log - The natural logarithm n of a number x is the solution to

$$e^n = x \text{ where } e = 2.718$$

When analyzing statistical cost functions using the logs of the dependent variable and the independent variables allows simpler interpretation of the results. When logs are used in a regression or model a one to one relationship exists between the independent variables and the dependent variable. For example, the model described in the paper expresses the cost of a surgical procedure as a function of a number of variables, one of which is area wages. If the coefficient of area wages in a model expressed in logs were .51 then a 1 percent increase in area wages will result in a .51 percent increase in the cost of the procedure.

Herfindahl Index - The Herfindahl index measures the degree to which different firms, or in this case hospitals, produce the same product.

Normal and Log-Normal Distributions - A Normal distribution is a bell shaped grouping or distribution of values around some central value such as the mean. A log-normal distribution is one where the natural logarithm of the values follows a normal distribution.

Arithmetic Mean - The arithmetic mean is derived by summing a set of values and dividing that sum by the number of values in the set.

Geometric Mean - The geometric mean of a set of values is derived by summing the natural logarithms of the set and dividing that sum by the number of values in the set.

Standard Deviation - Given a particular set of values and their distribution, the standard deviation is an absolute measure of distance from the mean within such a distribution. For example, within any normal distribution of values, 95 percent of the values are within 2 standard deviations of the arithmetic mean.

Coefficient of Variation - Given a particular set of values and their distribution, the coefficient of variation is a relative measure of distance from the mean within such a distribution. The coefficient of variation expresses the standard deviation as a percentage of the mean and hence, is independent from the unit of measurement.

Natural Logarithm - (see log).

t-value - The t-value expresses the amount of 'confidence' that a particular value is within a certain range of the 'true' value. The sign indicates the direction of the coefficient and the magnitude represents teh amount of confidence in the value.

Adjusted R Squared - The value of adjusted R squared measures the 'goodness of fit' of a particular regression, while controlling for the positive bias of a model, or in this case, a statistical cost function. The closer adjusted R squared is to one the better the 'fit' of the regression.

F - The F-statistic measures the amount of 'confidence' that the model is within a certain range of the 'true' model. Specifically, it expresses the ratio of the amount of error. Like the t-value, a higher F-statistic denotes a greater degree of 'confidence' and hence a model which more closely approximates the 'true' or 'actual' model.

APPENDIX C:

Should HCFA Use Diagnosis Related Groups (DRGs) as a Prospective Payment System for Hospital-Based Ambulatory Surgery?

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SHOULD HCFA USE DIAGNOSIS RELATED GROUPS (DRGS) AS A PROSPECTIVE PAYMENT SYSTEM FOR HOSPITAL-BASED AMBULATORY SURGERY?

A POLICY ANALYSIS

HCFA Cooperative Agreement #17-C-99026/1-01

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SHOULD HCFA USE DIAGNOSIS RELATED GROUPS (DRGS) AS A PROSPECTIVE PAYMENT SYSTEM FOR HOSPITAL-BASED AMBULATORY SURGERY?

Introduction

This is the first in a series of policy analyses designed to advise the Health Care Financing Administration on a technically feasible and politically acceptable approach to prospective payment for hospital-based ambulatory surgery for Medicare recipients. Congress has mandated that HCFA design this prospective payment system with a report due to Congress in 1989. Extension of the prospective payment system to all hospital outpatient ambulatory care for Medicare is required in a second HCFA report to Congress, due in 1991.

While HCFA's initial report to Congress is limited to prospective payment for ambulatory surgery in hospital outpatient departments, this prospective payment system cannot be designed in a vacuum. This is because at least four additional issues, three of them also mandated for Congressional examination, impinge upon the design of a payment system for hospital-based ambulatory surgery. The first Congressional requirement is that a "blended rate" be used in reimbursing hospital OPDs and free standing surgi-centers; that is, the reimbursement for the facility component of free-standing surgi-centers must be made equivalent to the reimbursement of hospital OPDs over a series of four years beginning in 1986.

The second Congressional mandate is of course the extension of a prospective payment system to all hospital outpatient department care for Medicare recipients by 1991. While hospital-based ambulatory surgery is highly visible, it actually accounts, in both volume and cost, for a minority of the care delivered to Medicare recipients in hospital OPDs. In 1985, visits involving a surgical procedure were estimated at about five percent of all visits and about a quarter of all billed charges.

The third Congressionally mandated requirement involves the whole issue of reimbursement for physicians' fees. This broad issue is currently the subject of a large HCFA project funded at Harvard; William Hsaio is principal investigator. The physician fee project is in the process of attaching relative values to the entire range of services performed by physicians, including of course surgery performed in an ambulatory setting.

Finally, while only ambulatory care reimbursement for Medicare recipients falls under the Congressional mandate, given Medicare's leadership position in the health care financing arena, any system designed for Medicare should be attractive to Medicaid and to private third party payers as well.

Keeping in mind these real-life constraints, this position paper examines one alternative which must be considered for a prospective payment system for ambulatory surgery. This alternative is simply the extension of the current inpatient prospective payment system using diagnostic related groups (DRGs) to hospital-based ambulatory surgery. The purpose of this paper is to evaluate the utility of using DRGs for prospective payment of hospital outpatient surgery for Medicare.

To examine this issue, the Brandeis research group analyzed the HCFA 1985 hospital outpatient department five percent sample file. This analysis selected visits with at least one valid ICD-9-CM ambulatory procedure for the Medicare 65 and over population. About a quarter of the visits had more than one procedure; for these visits, the more resource intensive procedure was chosen, so that each visit is represented only once.

Visits with ambulatory surgery totalled about $1.8 billion dollars in total billed charges when projected upward to the entire aged Medicare population. The distribution of these visits into medical as opposed to surgical DRGs is shown in Table 1 at the end of this paper. Nearly eighty percent of the charges for visits with procedures grouped into surgical DRGs, a preliminary indication that a prospective payment system using the DRG approach might be feasible for a majority of hospital outpatient ambulatory surgery.

Arguments for DRGs

In order to examine the utility of DRGs as a payment mechanism for hospital based ambulatory surgery, Brandeis classified the original visit data for hospital OPDs from HCFA's five percent sample file into individual DRGs.

Tables 2 and 3 present the leading DRGs, both medical and surgical, in terms of volume of total visits, mean billed charges, total billed charges and coefficients of variation. Table 4 projects these DRGs to the total Medicare aged population.

Briefly, one surgical DRG -- lens procedures -- accounts for about a quarter of the volume of visits for surgery, and for over half of all billed charges. This DRG had a mean billed charge of $1,534 for the hospital component of the surgery for 1985 and a coefficient of variation which is quite narrow -- only .48. The remainder of hospital based ambulatory surgery procedures are fragmented among a number of other DRGs, none of which account for even five percent of the billed charges for ambulatory surgery. Digestive system endoscopies are in second place. Although coded in the ICD-9 surgical range, considerable controversy exists as to whether these are surgical procedures. For example, they are performed primarily by medical sub-specialists.

With this background, the arguments in favor of the DRG approach as a prospective payment system for hospital based ambulatory care can be stated as follows:

- The DRG system is both familiar to hospitals and well-entrenched politically for inpatient care.
- The primary purpose of the Congressional mandate is to regulate hospital outpatient department charges to Medicare. These charges are currently reimbursed on a "cost" basis. With the inpatient side of hospital care being more tightly regulated, hospitals currently have considerable financial incentives to deliver as much care as possible on the outpatient side.

- A substantial majority of hospital outpatient department surgery was done on an inpatient basis as little as five years ago and thus fell into the original design of the DRG system.
- Some types of surgery -- such as cataract removal and lens implantation -- are done in 1988 in both an inpatient and same day surgery setting.

If it could be demonstrated that the weights currently in use for inpatient surgery DRGs have the same relative resource use in a same day surgery setting, a complete mechanism for a prospective payment system for ambulatory surgery would already be in place. This system would require only relatively minor changes in hospital reporting: that is, the treatment of ambulatory surgery as a "zero day" stay and its transfer for reimbursement purposes to the Part A MEDPAR file from the Part A hospital outpatient department file. Using this methodology, zero day stays could simply have the weights assigned by the Prospective Payment Assessment Commission (PROPAC) discounted to accommodate the room and board portion of hospital inpatient expenses. In the next section, the key issue of weighting surgical DRGs on an inpatient as opposed to an outpatient basis is further explored.

Is the Ratio of Inpatient to Outpatient Service Use Constant Across DRGs?

Tables 5 and 6 present a first attempt to use PROPAC weights for DRGs formed by visits for ambulatory surgery without alteration from the inpatient standards. As is immediately apparent from the ratio for PROPAC weight to total billed charges in Table 5, this key ratio varies by a factor of ten. Thus, the idea that outpatient DRGs could be reimbursed using a simple ratio to inpatient DRGs is not feasible.

Very expensive ambulatory procedures (such as cataract surgery) tend to have PROPAC weights which differ little from much less expensive ambulatory procedures (such as anal surgery). The clinical reason for this is almost certainly that cataract surgery represents a homogeneous set of procedures. Other homogeneous groups of procedures are D and C's, carpal tunnel releases, breast biopsies, and other eye procedures. All of these DRGs have relatively similar ratios of outpatient facility charges to PROPAC weights. Iris procedures, anal procedures, and skin procedures, however, are clinically heterogeneous, with only the more minor ones being performed on an outpatient basis. For example, the range of anal procedures done in DRG 157 includes anal biopsy on an outpatient basis and sphincteroplasty for anal prolapse which would be done only on an inpatient basis. Under these circumstances, it appears as though the DRGs would require an independent set of weights calculated for ambulatory surgery.

Another analysis, from the Center for Health Policy Studies, came to this same conclusion while analyzing surgical DRGs for private patients reimbursed for by Blue Cross of Eastern Pennsylvania (CHPS, 1987). CHPS also found that total hospital reimbursement increased when outpatient surgery was put on a DRG basis in the two experimental hospitals they studied. Since the mix of DRGs for ambulatory surgery is considerably different for younger, private patients than for the aged Medicare population, Table 7 has been adapted from the CHPS Blue Cross study and is included here. The only ambulatory surgery DRGs found in common between the two populations are D and C's (DRG 364) and carpal tunnel release (DRG 6).

In order to justify use of a particular system in both inpatient and ambulatory settings, one has to be able to make consistent comparisons in the two settings. Use of the PROPAC weights allows these comparisons. Using these weights, two studies have shown that the ratio of resource use for particular surgical DRGs is different in the inpatient and outpatient settings. The conclusion is that inpatient DRGs cannot be simply translated for use in either aged or younger ambulatory surgery populations.

Additional Arguments Against the Use of DRGs to Pay for Hospital Based Ambulatory Surgery

There are, of course, additional political and technical arguments against the DRG approach as well. These include:

- DRGs use ICD-9-CM procedure coding for the formation of all surgical groups. The Part A hospital outpatient department reimbursement formerly used ICD-9-CM just as inpatient reporting did. Beginning in 1987, however, CPT-4 coding (HCSPCS) has been mandated for the fiscal intermediaries for all hospital outpatient department care. Moving ambulatory surgical procedures back to the old ICD-9-CM system in order to accommodate DRGs could be seen as a step backward.

- CPT-4 is generally acknowledged by both clinicians and researchers to be a far superior coding system to ICD-9 procedure codes, especially for outpatient procedures.

- The free-standing surgi-centers have always used CPT-4 for both their facility and physician component reimbursement.

- About a fifth of all charges for ambulatory surgery are for visits which fall into a medical rather than a surgical DRG. The most common medical DRGs as shown in Table 2 are digestive disorders and skin disorders. These visits are for procedures which were not performed inpatient as the reason for admission ten years ago when DRGs were first developed. The issue is more pervasive than might first appear since visits for these procedures tend to be inexpensive and thus more numerous. In fact, although only 21 percent of all ambulatory surgery charges fell into a medical DRG, almost half of all visits with an ICD-9-CM defined surgical procedure fell into medical DRGs.

- Even if most ambulatory surgical procedures could be accommodated by the DRG system using PROPAC weights, the DRGs were never designed for non-procedure oriented ambulatory care. Thus, DRGs cannot accommodate charges for over 90 percent of all hospital OPD visits.
- Finally, an outpatient case mix classification system, ambulatory visit groups (AVGs), has been developed by Yale University and is in its second generation. AVGs use CPT-4 coding, cover ambulatory surgical procedures as well as all other ambulatory care, and are designed to be used in any ambulatory setting.

Conclusions

The lack of relationship of resource use in the same DRG when the surgery is performed on an inpatient as opposed to an outpatient basis greatly lessens the appeal of using DRGs to reimburse for ambulatory surgery. This argument is strengthened by the fact that the lack of relationship of resource use has now been demonstrated in both Medicare and younger populations. Another powerful deterrent is the significant minority of invasive, borderline surgical procedures which do not fall into a surgical DRG in the first place.

Since a prospective payment system for all hospital OPD ambulatory care will be required in any case by 1991, it appears to make more policy sense to use the same grouping mechanism for all ambulatory care.

Ambulatory visit groups (AVGs) represent such a mechanism. The AVG for lens procedures greatly resembles the inpatient DRG for lens procedures. This single AVG captures half of all hospital outpatient charges for surgery. Like DRGs, other AVGs are much more finely divided but, unlike DRGs, they are much more specific to ambulatory surgery.

Another powerful incentive for using AVGs as the reimbursement vehicle has already been mentioned. This is that ambulatory surgery centers are Congressionally mandated to be reimbursed under the same prospective payment system as hospital based clinics, using a "blended rate" for the facilities component of each. This is much simpler to do using AVGs; the surgi-centers are unfamiliar with ICD-9-CM and have always used CPT-4 coding. Using DRGs could thus present substantial implementation problems for these centers. For these reasons, the Brandeis team recommends that HCFA not use DRGs as a prospective payment system for hospital-based ambulatory surgery.

The cost of outpatient care continues to be a serious problem for HCFA and other third party payers. For example, the New York Times (March 8, 1988) reports that hospital based outpatient care "... still lacks the kinds of controls on the cost and appropriateness of procedures that the government and private insurers established for hospitals in the early 1980s." A second position paper in this series will discuss the AVGs in detail, with particular emphasis placed on their utility in a prospective payment system for all hospital OPD visits.

Table 1

Distribution of Total Billed Charges by Surgical and Medical DRGs

	Percent of total billed charges falling into:		
Body system	Surgical DRGs	Medical DRGs	All DRGs
Eye	57.8%	1.6%	59.4%
Digestive system	3.1	7.2	10.3
Skin/tissue	5.4	1.3	6.7
Renal/kidney	1.5	3.5	4.9
Other	10.9	7.8	18.7
Total	78.6%	21.4%	100.0%

	Total billed charges projected to aged Medicare population (in millions)		
Body system	Surgical DRGs	Medical DRGs	All DRGs
Eye	$ 1,010	$ 28	$ 1,038
Digestive system	54	126	180
Skin/tissue	94	23	117
Renal/kidney	26	136	326
Other	190	136	326
Total	$ 1,374	$ 374	$ 1,748

Source: HCFA 1985 hospital outpatient department five percent sample file. The projection to the entire aged Medicare population uses a multiplier of 36.55 rather than 20 because of losses due to technical problems with the file.

Table 2

Volume of Visits for Top Twenty-five DRGs for Ambulatory Surgery Procedures

Surgical or medical	DRG number	DRG description	Total number of visits	Percent of total visits
S	39	Lens procedures	16,234	24.3%
M	182	Esophagitis, gastroenteritis and miscellaneous digestive disorders over age 69 or with comorbidity	3,874	5.8
S	269	Other skin, subcutaneous tissue and breast operating room procedures over age 69 or with comorbidity	3,037	4.5
M	188	Other digestive system diagnoses over age 69 or with comorbidity	2,079	3.1
M	183	Esophagitis, gastroenteritis and miscellaneous digestive disorders age 65-69 without comorbidity	1,495	2.2
M	47	Other disorders of the eye, age 65 or over without comorbidity	1,352	2.0
S	40	Extraocular procedures except orbit, age 65 or over	1,275	1.9
S	270	Other skin, subcutaneous tissue and breast operating room procedures under age 70 without comorbidity	1,136	1.7
M	189	Other digestive system diagnoses age 65-69 without comorbidity	1,019	1.5
S	262	Breast biopsy and local excision for non-malignancy	984	1.5
M	280	Trauma to the skin, subcutaneous tissue and breast over age 69 or with comorbidity	917	1.4
M	174	G.I. hemorrhage over age 69 or with comorbidity	818	1.2
M	283	Minor skin disorders over age 69 or with comorbidity	784	1.2
S	157	Anal procedures over age 69 or with comorbidity	773	1.2
S	6	Carpal tunnel release	744	1.1
M	325	Kidney and urinary tract signs and symptoms over age 69 or with comorbidity	697	1.0
M	348	Benign prostatic hypertrophy over age 69 or with comorbidity	694	1.0
S	38	Primary iris procedures	658	1.0%

Table 2 (continued)

Volume of Visits for Top Twenty-five DRGs for Ambulatory Surgery Procedures

Surgical or medical	DRG number	DRG description	Total number of visits	Percent of total visits
M	172	Digestive malignancy over age 69 or with comorbidity	631	1.0%
S	42	Intraocular procedures except retina, iris and lens	613	1.0
S	364	D & C, conization except for malignancy	611	0.9
M	467	Other factors influencing health status	569	0.9
M	318	Kidney and urinary tract neoplasms over age 69 or with comorbidity	553	0.8
M	331	Other kidney and urinary tract diagnoses over age 69 or with comorbidity	516	0.8
M	320	Kidney and urinary tract infections over age 69 or with comorbidity	512	0.8

Total number of visits accounted for by top 25 DRGs	42,575	
Percent of visits accounted for by top 25 DRGs based on 66,848 visits for patients 65 and over		63.7%
Number of visits in medical DRGs in top 25	16,510	
Number of visits in surgical DRGs in top 25	26,065	

Source: HCFA 1985 hospital outpatient department five percent sample file.

Table 3

Mean Billed Charges for the Top Twenty-five DRGs for Ambulatory Surgery Procedures

DRG number	DRG description	Mean billed charge	Coefficient of variation
39	Lens procedures	$ 1,534	.48
182	Esophagitis, gastroenteritis and miscellaneous digestive disorders over age 69 or with comorbidity	288	.84
269	Other skin, subcutaneous tissue and breast operating room procedures over age 69 or with comorbidity	276	1.07
188	Other digestive system diagnoses over age 69 or with comorbidity	307	.71
183	Esophagitis, gastroenteritis and miscellaneous digestive disorders age 65-69 without comorbidity	276	.70
47	Other disorders of the eye, age 65 or over without comorbidity	527	1.36
40	Extraocular procedures except orbit, age 65 or over	573	.85
270	Other skin, subcutaneous tissue and breast operating room procedures under age 70 without comorbidity	307	1.04
189	Other digestive system diagnoses age 65-69 without comorbidity	506	.76
262	Breast biopsy and local excision for non-malignancy	668	.65
280	Trauma to the skin, subcutaneous tissue and breast over age 69 or with comorbidity	135	1.02
174	G.I. hemorrhage over age 69 or with comorbidity	287	1.02
283	Minor skin disorders over age 69 or with comorbidity	265	1.08
157	Anal procedures over age 69 or with comorbidity	414	.66
6	Carpal tunnel release	653	.51
325	Kidney and urinary tract signs and symptoms over age 69 or with comorbidity	390	.90
348	Benign prostatic hypertrophy over age 69 or with comorbidity	$ 429	.70

Table 3 (continued)

Mean Billed Charges for the Top Twenty-five DRGs for Ambulatory Surgery Procedures

DRG number	DRG description	Mean billed charge	Coefficient of variation
38	Primary iris procedures	$ 276	1.06
172	Digestive malignancy over age 69 or with comorbidity	324	.80
42	Intraocular procedures except retina, iris and lens	1,032	.85
364	D & C, conization except for malignancy	638	.47
467	Other factors influencing health status	280	.96
318	Kidney and urinary tract neoplasms over age 69 or with comorbidity	404	.78
331	Other kidney and urinary tract diagnoses over age 69 or with comorbidity	345	.92
320	Kidney and urinary tract infections over age 69 or with comorbidity	$ 409	.84
	All DRGs	$ 715.40	1.01

Source: HCFA 1985 hospital outpatient department five percent sample file.

Table 4

Mean Billed Charges Projected to the Medicare Population for the Leading Twenty-five DRGs for Ambulatory Surgery Procedures

DRG number	DRG description	Total number visits in Medicare population	Total billed charges (in millions)
39	Lens procedures	593,424	$ 910.3
182	Esophagitis, gastroenteritis and miscellaneous digestive disorders over age 69 or with comorbidity	141,577	40.8
269	Other skin, subcutaneous tissue and breast operating room procedures over age 69 or with comorbidity	110,989	30.6
188	Other digestive system diagnoses over age 69 or with comorbidity	75,980	23.3
183	Esophagitis, gastroenteritis and miscellaneous digestive disorders age 65-69 without comorbidity	54,627	15.1
47	Other disorders of the eye, age 65 or over without comorbidity	49,399	26.0
40	Extraocular procedures except orbit, age 65 or over	46,590	26.7
270	Other skin, subcutaneous tissue and breast operating room procedures under age 70 without comorbidity	41,508	12.7
189	Other digestive system diagnoses age 65-69 without comorbidity	37,233	18.8
262	Breast biopsy and local excision for non-malignancy	35,962	24.0
280	Trauma to the skin, subcutaneous tissue and breast over age 69 or with comorbidity	33,519	4.5
174	G.I. hemorrhage over age 69 or with comorbidity	29,903	8.6
283	Minor skin disorders over age 69 or with comorbidity	28,657	7.6
157	Anal procedures over age 69 or with comorbidity	28,242	11.7
6	Carpal tunnel release	27,191	17.8
325	Kidney and urinary tract signs and symptoms over age 69 or with comorbidity	25,481	9.9

Table 4 (continued)

Mean Billed Charges Projected to the Medicare Population for the Leading Twenty-five DRGs for Ambulatory Surgery Procedures

DRG number	DRG description	Total number visits in Medicare population	Total billed charges (in millions)
348	Benign prostatic hypertrophy over age 69 or with comorbidity	25,359	$ 10.9
38	Primary iris procedures	24,040	6.6
172	Digestive malignancy over age 69 or with comorbidity	23,063	7.5
42	Intraocular procedures except retina, iris and lens	22,403	23.1
364	D & C, conization except for malignancy	22,330	14.2
467	Other factors influencing health status	20,791	5.8
318	Kidney and urinary tract neoplasms over age 69 or with comorbidity	20,204	8.2
331	Other kidney and urinary tract diagnoses over age 69 or with comorbidity	18,861	6.5
320	Kidney and urinary tract infections over age 69 or with comorbidity	18,714	7.7
	Total billed charges accounted for by top 25 DRGs		$ 1,278.9
	Percent of total billed charges for surgical procedures accounted for by top 25 DRGs based on $ 1.748 billion for patients 65 and over		73.2%

Source: HCFA 1985 hospital outpatient department five percent sample file. The projection to the entire aged Medicare population uses a multiplier of 36.55 rather than 20 because of losses due to technical problems with the file.

Table 5

Leading Ten Surgical DRGs with Ambulatory Surgery Procedures by Ratio of PROPAC Weight to Mean Charges

DRG number	Surgical DRG description	PROPAC weight	Mean charges	Ratio of weig to mea charge (÷ 100
39	Lens procedures	0.57	$ 1,534	26.9
364	D & C, conization except for malignancy	0.39	638	16.4
6	Carpal tunnel release	0.41	653	15.9
42	Intraocular procedures except retina, iris and lens	0.65	1,032	15.9
262	Breast biopsy and local excision for non-malignancy	0.43	668	15.5
40	Extraocular procedures except orbit, age 65 or over	0.41	573	14.0
38	Primary iris procedures	0.40	276	6.9
157	Anal procedures over age 69 or with comorbidity	0.73	414	5.7
270	Other skin, subcutaneous tissue and breast operating room procedures under age 70 without comorbidity	0.76	307	4.0
269	Other skin, subcutaneous tissue and breast operating room procedures over age 69 or with comorbidity	1.13	276	2.4

Source: HCFA 1985 hospital outpatient department five percent sample file. Weights from Prospective Payment Assessment Commission for 1985.

Table 6

Leading Fifteen Medical DRGs with Ambulatory Surgery Procedures by Ratio of PROPAC Weight to Mean Charges

DRG number	Medical DRG description	PROPAC weight	Mean charges	Ratio of weight to mean charges (÷ 100)
47	Other disorders of the eye, age 65 or over without comorbidity	0.42	$ 527	12.5
189	Other digestive system diagnoses age 65-69 without comorbidity	0.53	506	9.5
348	Benign prostatic hypertrophy over age 69 or with comorbidity	0.63	429	6.8
325	Kidney and urinary tract signs and symptoms over age 69 or with comorbidity	0.65	390	6.0
183	Esophagitis, gastroenteritis and miscellaneous digestive disorders age 65-69 without comorbidity	0.51	276	5.4
182	Esophagitis, gastroenteritis and miscellaneous digestive disorders over age 69 or with comorbidity	0.60	288	4.8
320	Kidney and urinary tract infections over age 69 or with comorbidity	0.86	409	4.8
318	Kidney and urinary tract neoplasms over age 69 or with comorbidity	0.92	404	4.4
188	Other digestive system diagnoses over age 69 or with comorbidity	0.72	307	4.3
331	Other kidney and urinary tract diagnoses over age 69 or with comorbidity	0.83	345	4.2
283	Minor skin disorders over age 69 or with comorbidity	0.64	265	4.1
467	Other factors influencing health status	0.72	280	3.9
174	G.I. hemorrhage over age 69 or with comorbidity	0.91	287	3.2
172	Digestive malignancy over age 69 or with comorbidity	1.07	324	3.0
280	Trauma to the skin, subcutaneous tissue and breast over age 69 or with comorbidity	0.54	135	2.5

Source: HCFA 1985 hospital outpatient department five percent sample file. Weights from Prospective Payment Assessment Commission for 1985.

Table 7

Most Common Outpatient Surgical DRGs in the Northeastern Pennsylvania Blue Cross Population, 1985 - 1986

DRG number	Description	Number of cases
364	D & C, conization, except for malignancy	172
362	Laparoscopic tubal interruption	160
187	Dental extractions and restorations	159
222	Knee procedures, under age 70 without complications	144
360	Vagina, cervix and vulva procedures	113
62	Myringotomy, under age 18	92
262	Breast biopsy and local excision for non-malignancy	91
270	Other skin, subcutaneous tissue and breast operating room procedures, under age 70, without complications	84
78	Laparoscopy and endoscopy except tubal interruption	78
225	Foot procedures	73
6	Carpal tunnel release	64
358	Uterus and adenexa procedures for non-malignancy except tubal interruption	48
163	Hernia procedures, under age 18	33
159	Hernia procedures, except inguinal and femoral over age 69 or with complications	29

Source: Adapted from Center for Health Policy Studies, Table 15, p. 30.

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APPENDIX D:

Development of a Prospective Payment System for Hospital Based Ambulatory Surgery: An Evaluation of Ambulatory Visits Groups (AVGs)

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DEVELOPMENT OF A PROSPECTIVE PAYMENT SYSTEM FOR HOSPITAL BASED AMBULATORY SURGERY: AN EVALUATION OF AMBULATORY VISIT GROUPS (AVGS)

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EXECUTIVE SUMMARY

Hospital outpatient department care is the fastest growing component of the Medicare program. Total billed charges increased from $500 million in 1974 to $6.5 billion in 1985, a thirteen fold increase. This rate of growth far out distanced the increase in inpatient charges (Helbing and Latta, 1988). A substantial portion of this increase in hospital outpatient care was in ambulatory surgery. In 1986, over 40 percent of hospital operations were performed in outpatient settings, as compared with only 16 percent as recently as 1980 (PROPAC, 1987; American Hospital Association, 1987; Schramm and Gabel, 1988). Congress has now mandated that the Health Care Financing Administration develop a prospective payment system similar to the diagnosis related group (DRG) system already in place for inpatient care to control the cost of outpatient care.

Ambulatory surgery is the first component of outpatient care mandated for placement into a prospective payment system in 1989. The remainder of ambulatory care is to follow by 1991. This policy analysis paper concentrates on ambulatory surgery. It is an abridgement of a 92 page policy analysis delivered to HCFA in December, 1988; the original paper contains all tables in their complete form and should be referred to by those readers requiring more detail.

The method used to analyze ambulatory surgery for this policy analysis was developed at Yale University; it resembles DRGs in many respects and is named ambulatory visit groups (AVGs). The AVGs require ICD-9-CM coding for diagnosis and CPT-4 coding for procedures. CPT-4 coding became available for the hospital component of the bill for Medicare recipients having ambulatory surgery in July of 1987. The tables presented are produced from billing data for the first three months of Fiscal Year 1988 (October 1 - December 31, 1987). Only visits with a valid surgical CPT-4 code were selected. Both aged Medicare beneficiaries and the under 65 disabled beneficiaries are included in the analysis, as is both scheduled surgery and surgery originating in a visit to the emergency department.

Highlights of the findings:

- o Ambulatory surgery had total billed charges of about $2.5 billion for the hospital facility component in Fiscal Year 1988.

- Cataract surgery with lens implantation accounted for half of this amount. Other eye procedures accounted for at least another six percent.
- Mean billed charges for the AVG which contains cataract surgery was $2.026.
- For all ambulatory surgery, charges were $908.
- For emergency department surgery, they were $376.
- Ambulatory visit groups, using a 1985 unmodified Yale program, grouped 80 percent of the billing data. Minor updating and modifications made by Brandeis improved this to 93 percent of total billed charges for all ambulatory surgery.
- The 25 most common AVGs accounted for 80 percent of the dollar volume of ambulatory surgery.
- Coefficients of variation are comparable to those of the DRGs. For the cataract surgery AVG, the untrimmed coefficient of variation was 0.37.
- Emergency department surgery was substantially different in type of procedures performed (minor suturing and splinting) than was scheduled surgery. Only six percent of dollar volume was emergency department surgery, although 11.8 percent of the visits came in through the emergency department.
- Surgery performed on the disabled was quite similar to surgery performed on the aged. This surgery is a small part of the overall Medicare ambulatory surgery (approximately six percent of dollar volume).

The most common CPT-4 codes for ambulatory surgery, including mean billed charges and volume of visits, are also shown in the unabridged report. This is the first time CPT-4 codes have been available for the hospital facilities portion of ambulatory surgery on the Medicare population. Of interest is the finding that the 25 most common CPT-4 codes account for 73 percent of the dollar volume and have coefficients of variation comparable to the 25 leading AVGs.

Based on the analyses reported in this document, the Brandeis research group was able to develope preliminary conclusions regarding the relative utility of AVGs as compared to CPT-4 codes as vehicles for payment for outpatient surgery performed in hospital settings. In essence, while the AVGs and CPT-4 coding perform almost equally well for the most common ambulatory surgery procedures, the AVGs are preferable to the CPT-4 codes for payment purposes. The AVGs have six significant advantages over CPT-4 coding. These advantages are:

- There are just 208 ambulatory surgery AVGs compared with over 2,000 CPT-4 codes which encompass ambulatory surgery. Thus, the AVG structure is simpler than the CPT-4 codes.
- In the case of visits with more than one procedure performed, AVGs automatically select the most resource intensive procedure. This is not possible using CPT-4 codes alone.
- AVGs take into account the diagnosis as well as the procedure. This is important because the AVGs, in effect, locate the patient along two dimensions -- diagnosis and procedure.
- Based on the findings for ambulatory surgery, a revised AVG system comprising 100-150 groups could probably accommodate all hospital OPD visits, including both medical and surgical. Health Systems International in New Haven, Connecticut, is currently funded by HCFA to produce such a system.
- Reimbursement for ambulatory surgery centers currently uses six categories of CPT-4 codes for the facility component. Hospital OPDs are currently subjected to a "blended rate" based on these six categories. These six categories are medically heterogeneous. This approach does not appear feasible for accommodating other types of visits in the hospital OPD.
- Most importantly, a prospective payment system for ambulatory surgery will almost certainly be extended to all of hospital outpatient department care in the future. Diagnoses are crucial for reimbursing visits for medical reasons. The AVGs provide a system for grouping all outpatient care while CPT-4 codes are adequate only for those visits with a procedure and where diagnosis is irrelevant.

INTRODUCTION

The purpose of this condensed policy analysis paper is to evaluate the use of AVGs for payment for outpatient surgery provided in hospital outpatient departments. This paper is an extension of an earlier evaluation of these categories for this purpose (Lion et al., 1988b). The earlier report was based on older (1985) data where procedures were coded using the ICD-9 system instead of the CPT-4 codes used by the AVGs. The research to be reported here used the HCFA hospital outpatient department billing file for a three month period at the beginning of Fiscal Year 1988 (October 1 - December 31, 1987). These very recent data were selected because hospital outpatient departments were required to switch from ICD-9 procedure coding to CPT-4 procedure coding for ambulatory surgery effective in Fiscal 1988. More specifically, HCPCS coding, a HCFA modification of CPT-4 procedure coding, is now required. While not all hospitals met the requirement, a sufficient number did to provide over 250,000 visits for the final analysis.

The ambulatory visit groups were developed by Yale University to classify all outpatient care, surgical and non-surgical, irrespective of the site where the care was provided (physicians' office, outpatient clinic, freestanding clinic, freestanding surgical center). AVGs are the outpatient equivalent of the classification system developed by Yale for inpatient care -- diagnosis related groups (DRGs). Just as a hospital stay is the unit of analysis for the DRGs, the outpatient visit, with all of its component procedures, is the unit of analysis for AVGs. Since AVGs require CPT-4 coding for their construction, this policy analysis provides the first evaluation of AVGs for visits to hospital outpatient departments for ambulatory surgery by Medicare beneficiaries. (Health Systems International in New Haven, Connecticut is currently funded to make a modified AVG system available for commercial use within two years. Brandeis sits on the Advisory Committee for the Health Systems International project, as does Robert Fetter of Yale University, the developer of DRGs and AVGs.)

Two previous Brandeis policy analysis papers have considered the development of a prospective payment system for ambulatory surgical care. One paper considered the possibility of using DRGs as the vehicle for an ambulatory surgery prospective payment system. The DRG approach was rejected for two major reasons:

o Forty seven percent of the outpatient surgical procedures, representing 20 percent of total dollar volume, were not sufficiently serious to have required hospitalization in the past. These visits fell into medical DRGS.

o Of the procedures formerly performed inpatient and thus falling into surgical DRGS, whole DRGs had moved outpatient in some instances (cataract surgery being a prime example) while only minor procedures had moved outpatient in other, mixed DRGS. Thus, there was no stable relationship between the weight for an inpatient DRG and the resource use of its outpatient equivalent. This means that DRGs are not a simple option for paying for outpatient surgery for hospitals.

For further details, see the first policy analysis paper (Lion et al., 1988a).

The second policy analysis was an initial attempt in considering ambulatory visit groups (AVGs) as a classification tool for reimbursement. Analysis was limited to the HCFA 1985 five percent sample file for hospital outpatient claims. Since CPT-4 codes were not available for these data, each surgical visit had to be converted from ICD-9-CM procedure coding to CPT-4 coding in order to be assigned an AVG. This paper was, therefore, only a preliminary examination of the feasibility of using AVGs. It did, however, describe the AVG construction in somewhat more detail than is reported here. (Lion et al., 1988b).

This policy analysis paper is based on analyses of the Fiscal 1988 hospital outpatient file. This file is much more appropriate for a detailed evaluation of the AVGs than were the 1985 data in that the ambulatory visit groups were designed to use CPT-4 codes. Thus, since there is no need to re-code data, there is no risk that findings reflect the assumptions needed for re-coding.

All ambulatory surgery is included in this analysis. That is, the analysis includes both scheduled procedures and non scheduled emergency procedures as well as including the approximately ten percent of Medicare beneficiaries who are under 65 but who qualify by being disabled or by suffering from end stage renal disease. Both groups were singled out for special analysis which will be only briefly reported here. All summaries of tables in this policy analysis refer to the combined elderly and disabled populations and to combined scheduled and emergency surgery.

The next section of this paper provide a description of the AVGs. Following that section is a detailed discussion of the data and methods employed for the analysis. Then the findings from the data are presented. Next is the main section of this policy analysis paper, a discussion of the policy implications of developing a prospective payment system for hospital based ambulatory surgery. Issues discussed in this section include the following:

- o How well do AVGs account for complexity and severity?
- o What possibilities exist for the use of a simplified AVG reimbursement system?
- o What do the relative weights for the AVGs look like?
- o What would be the disadvantages of simply using the CPT-4 coding for a prospective payment system?
- o Are there other possible resource use measures to calibrate AVGs as an alternative to billed charges?

The final sections of this paper offers conclusions and recommendations for a prospective payment system.

A DESCRIPTION OF THE AVGS

The second generation AVGs described here were developed by Yale University and are based on 19 major diagnostic categories, similar in format to DRGs. They are visit specific, rather than relying on a broader concept such as episode of illness. Complete documentation on how the groups are formed is available from Yale (Schneider et al., 1986), and has been published in abbreviated form (Schneider et al., 1988). What follows is a brief summary derived from using the AVGs at Brandeis University.

One of the major advantages of the AVGS is that they require only five data elements for the formation of all but a few of their 570 groups. These data elements, readily available on billing data submitted to HCFA, are:

- o diagnosis in ICD-9-CM
- o procedure in CPT-4
- o "new" versus "established" patient status from CPT-4 coding

- patient age
- patient sex

The first three variables are used to actually form the final criteria for almost all of the final groups. New versus established patient is used only for non-procedural AVGs. Age and sex are used to check the internal consistency of the visit data, but these variables determine only about 15 groups. The CPT-4 codes needed for analyzing ambulatory surgery procedures by AVG are available on the HCFA hospital OPD data file beginning Fiscal 1988, as are all other variables. All CPT-4 codes necessary for analyzing the entire range of AVGs are expected to be available on the HCFA data file for Fiscal 1989. This analysis will represent the next phase of the Brandeis project in preparation for the 1991 Congressional Report.

In forming the AVGs, each of the 19 major diagnostic categories is first divided according to whether a significant invasive procedure was performed. If a procedure was performed, the groups are further divided according to type of procedure. If a procedure was not performed, the major diagnostic category is split again, based on "established" versus "new" patient status. Both "established" and "new" patient groups are then categorized into more discrete diagnostic classifications.

Previous work on evaluating AVGs for hospital based care and for oncology have been published by the Brandeis team (Lion, Malbon and Bergman, 1987; Lion et al., 1987). Using physician time, total provider time, total costs and total billed charges as measures of resource use, this work showed the AVGs to be generally feasible for the non-procedural groups and for procedural groups such as transfusion of blood products, chemotherapy, and radiation therapy which do not qualify as actual surgical procedures. Another project, using health maintenance organization data has also analyzed the AVGs. The HMO data, however, had no measure of resource use available (Hornbook, Johnson, and Hurtado, 1987).

There are two important differences between the major diagnostic categories used in forming AVGs and those that were used for the DRGs. First, one of the major diagnostic categories for ambulatory care is not disease related but instead is comprised of well-adult and well-child care. Second, oncology treatment forms its own separate major diagnostic category, accounting for 14 AVGs, rather than being distributed among numerous body systems, as was the case with the DRGs. (If the oncology procedure is diagnostic (a biopsy, for example), it does not fall into the oncology major diagnostic category but rather is distributed back to the body system in question. This is done by the AVG software.)

Figures 1 and 2 demonstrate the Yale formation of the AVGs. The AVG numbering system is not final at this time, but rather begins again for each major body system. Figure 1 shows the construction of AVGS for major diagnostic category (MDC) 02, diseases of the eye; Figure 2 shows the construction for MDC 06, diseases of the digestive system. Both of these major diagnostic categories occur frequently in the area of ambulatory surgery for the Medicare population. Of the 26 eye procedure AVGs, three do not qualify as ambulatory surgery but rather are diagnostic procedures. It should be kept in mind at this point that Health Systems International and its Advisory Committee, which includes HCFA and Brandeis, is seriously considering collapsing the new and established patient categories shown in the figures. This would remove an additional 9 eye categories.

DATA AND METHODS

In the Fall of 1986 when this cooperative agreement was beginning, HCFA arranged a "tap" of the billing data for Fiscal year 1988, to begin October 1, 1987. The "tap" was to encompass any bill for a visit to a hospital outpatient department which involved an ambulatory surgery procedure. Of the approximately 900,000 visits with procedures of any kind which initially qualified during the three month time period, 257,542 met all criteria (as will be subsequently discussed) and were ultimately selected. In other words, in projecting the actual number of visits with surgical procedures for the entire Medicare population, not all of the 900,000 initial visits selected were considered valid. Many of the visits fell into the CPT-4 procedure range (10,000 - 69,999), for example, but represented trivial, non-surgical events. As wide a net as possible was used to capture data initially, so that all valid ambulatory surgery could be analyzed.

Figure 1
Ambulatory Visit Groups for the Eye

- New Patient Groups -
02 : 00 - External Eye Disorders
02 : 01 - Refractive Errors
02 : 02 - Cataract, Aphakia & Pseudophakia
02 : 03 - Other Anterior Segment & Optic Nerve
02 : 04 - Retina, Choroid & Vitreous
02 : 05 - Visual Disturbances, Strabismus & Motility Disorders
02 : 06 - Eye Examination
02 : 07 - Fitting Contact Lens
02 : 08 - Other Diseases of the Eye

- Old Patient Groups -
02 : 20 - External Eye Disorders
02 : 21 - Refractive Errors
02 : 22 - Cataract, Aphakia & Pseudophakia
02 : 23 - Other Anterior Segment & Optic Nerve
02 : 24 - Retina, Choroid & Vitreous
02 : 25 - Visual Disturbances, Strabismus & Motility Disorders
02 : 26 - Eye Examination
02 : 27 - Fitting Contact Lens
02 : 28 - Other Diseases of the Eye

- Procedure Groups -
02 : 40 - Laser Eye Procedures, Anterior Segment
02 : 41 - Laser Eye Procedures, Posterior Segment
02 : 42 - Anterior Segment - Cataract
02 : 43 - Anterior Segment - Glaucoma, Class 1
02 : 44 - Anterior Segment - Glaucoma, Class 2
02 : 45 - Anterior Segment - Other, Class 1
02 : 46 - Anterior Segment - Other, Class 2
02 : 47 - Anterior Segment - Other, Class 3
02 : 48 - Anterior Segment - Other, Class 4
02 : 49 - Anterior Segment - Other, Class 5
02 : 50 - Posterior Segment, Class 1
02 : 51 - Posterior Segment, Class 2
02 : 52 - Posterior Segment, Class 3
02 : 53 - Plastic & Reconstructive, Eye, Class 1
02 : 54 - Plastic & Reconstructive, Eye, Class 2
02 : 55 - Plastic & Reconstructive, Eye, Class 3
02 : 56 - Plastic & Reconstructive, Eye, Class 4
02 : 57 - Plastic & Reconstructive, Eye, Class 5
02 : 58 - Plastic & Reconstructive, Eye, Class 6
02 : 59 - Strabismus & Muscle Procedures, Class 1
02 : 60 - Strabismus & Muscle Procedures, Class 2
02 : 61 - Other Surgery, Eye, Class 1
02 : 62 - Other Surgery, Eye, Class 2
02 : 63 - Ophthalmic Ultrasound
02 : 64 - Other Diagnostic Procedures, Eye, Class 1
02 : 65 - Other Diagnostic Procedures, Eye, Class 2

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Figure 2
Ambulatory Visit Groups for the Digestive and Hepatobiliary Systems and Pancreas

- New Patient Groups -
06 : 00 - Diseases & Disorders of Upper GI Tract
06 : 01 - Inflammatory Bowel Disease
06 : 02 - Gastroenteritis
06 : 03 - Irritable Bowel Syndrome & Other Colonic Disorders
06 : 04 - Routine Dental & Oral Disease
06 : 05 - Oral Fracture & Injury
06 : 06 - Rectal/Anal Disorders
06 : 07 - Hernia
06 : 08 - Cirrhosis, Hepatitis & Other Liver Dysfunction
06 : 09 - Cholecystitis & Pancreatitis
06 : 10 - Other Digestive & Hepatobiliary Disorders

- Other Patient Groups -
06 : 20 - Diseases & Disorders of Upper GI Tract
06 : 21 - Inflammatory Bowel Disease
06 : 22 - Gastroenteritis
06 : 23 - Irritable Bowel Syndrome & Other Colonic Disorders
06 : 24 - Routine Dental & Oral Disease
06 : 25 - Oral Fracture & Injury
06 : 26 - Rectal/Anal Disorders
06 : 27 - Hernia
06 : 28 - Cirrhosis, Hepatitis & Other Liver Dysfunction
06 : 29 - Cholecystitis & Pancreatitis
06 : 30 - Other Digestive & Hepatobiliary Disorders

- Procedure Groups -
06 : 40 - Anal & Rectal Procedures, Class 1
06 : 41 - Anal & Rectal Procedures, Class 2
06 : 42 - Anal & Rectal Procedures, Class 3
06 : 43 - Endoscopy-Colonoscopy, Class 1
06 : 44 - Endoscopy-Colonoscopy, Class 2
06 : 45 - Endoscopy-Colonoscopy, Class 3
06 : 46 - Endoscopy-Colonoscopy, Class 4
06 : 47 - Endoscopy-Biliary, Class 1
06 : 48 - Endoscopy-Biliary, Class 2
06 : 49 - Endoscopy-Biliary, Class 3
06 : 50 - Endoscopy-Biliary, Class 4
06 : 51 - Endoscopy-Upper GI, Class 1
06 : 52 - Endoscopy-Upper GI, Class 2
06 : 53 - Endoscopy-Upper GI, Class 3
06 : 54 - Endoscopy-Upper GI, Class 4
06 : 55 - Oral Procedures, Class 1
06 : 56 - Oral Procedures, Class 2
06 : 57 - Oral Procedures, Class 3
06 : 58 - Hernia Repair
06 : 59 - Liver Biopsy
06 : 60 - Other Surgery, Digestive Sys, Class 1
06 : 61 - Other Surgery, Digestive Sys, Class 2
06 : 62 - Other Surgery, Digestive Sys, Class 3
06 : 63 - Barium Meal
06 : 64 - Barium Enema
06 : 65 - Other Radiography, Digestive Sys
06 : 66 - Esophageal Physiologic Studies
06 : 67 - Other Medical Procedures, Digestive Sys

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Criteria for Usable Data

In order to qualify for the analysis, the visit was required to meet ALL of the following criteria:

1) Have a procedure coded in CPT-4 (HCPCS) rather than in ICD-9 CM.
2) Have a procedure coded in the CPT-4 range 10,000 - 69,999.
3) Not have veni-puncture (which is a non-surgical procedure performed by a laboratory technician) as the only surgical procedure. (Venipuncture is CPT-4 code 36415.)
4) Not have a local option code, that is one specific to a particular fiscal intermediary, as its CPT-4 code.
5) Have a valid diagnosis for the visit coded in ICD-9-CM.
6) Have a date of birth which could be converted to an actual age.
7) Have a valid sex code.
8) Have at least $25 in total billed charges.
9) Have the procedure occur in a charge field where an ambulatory surgery procedure might reasonably be expected to fall.

The first criterion excludes from the analysis visits to hospital OPDs which had not yet converted from ICD-9-CM to CPT-4 coding for the time period October 1 - December 31, 1987. Since hospitals (and fiscal intermediaries) converted to CPT-4 coding at various points during their own fiscal years, this limitation means that the data are not, strictly speaking, representative of the universe of visits which will appear on the calendar 1988 HCFA five percent sample file for visits to hospital outpatient departments. Since a large universe of visits was selected, however, and since there is little reason to believe that hospitals which complied promptly were systematically different from those which were late in complying, the sample analyzed in this policy analysis paper should be fairly representative of the nation as a whole. That is, the findings are not expected to substantially change when the more complete 1988 data become available on the sample file.

The purpose of the second criterion was to select only visits which actually had ambulatory surgery as defined by the American Medical Association's CPT-4 coding. The purpose of the third criterion was to remove simple veni-punctures from consideration as ambulatory surgery. It should be noted that veni-punctures (which are performed by laboratory technicians) are not the only procedures performed by non-surgeons which are found in this data set. Specifically, endoscopies performed by gastroenterologists (sub-specialists in internal medicine) are prominently represented in the data. These procedures, while invasive, are not as expensive as the average for all ambulatory surgery, but they are commonly performed in the OPD setting. The fourth criterion removed idiosyncratic coding which could not be generalized to the entire universe of visits.

The fifth, sixth, and seventh criteria (diagnosis, age, and sex) represent the additional data elements required by the Yale AVG program. Records deleted for not meeting these criteria accounted for only a small proportion of the total number of deletions. Apparently hospitals and fiscal intermediaries which were able to meet the new HCPCS coding requirement promptly were also able to code diagnosis, date of birth, and sex accurately.

The final two criteria, which dealt with minimal charges and inappropriate cost centers, address more subtle problems with the data set. The $25 lower limit is intended to remove partial bills from the data. These are bills which are too low to reflect all of the charges for even the most minimal visit for ambulatory surgery. The selection of only those billing centers which reflect actual ambulatory surgery billing addresses this same problem in a more sophisticated manner.

For example, the most common ambulatory surgery procedure performed on the Medicare population is removal of a cataract with insertion of a lens prosthesis. The artificial lens accounts for approximately $300 to $500, out of approximately $2,000 in total billed charges. However, a substantial number of bills for cataract procedures appeared in the data set with a charge of approximately $300 to $500 in the billing center for durable medical equipment and no other charges; these visits were assumed to be partial bills for the artificial lens and were therefore eliminated. Other partial billing arose in sterile supply and cast room cost centers. Of course, many smaller partial bills were eliminated by the $25 lower limit.

The Ambulatory Visit Group (AVG) Grouper Program

Once the data met all nine of the criteria previously specified, they were run through the Yale ambulatory visit group (AVG) program which the Brandeis research group had installed on an IBM mainframe computer. Although the data had been adapted to meet all of the Yale requirements for forming procedural AVGs, as previously described, about 20 percent of the visits did not initially group into procedural AVGs but rather fell into a medical AVG. That is, the program did not accept the procedure as being appropriate for the diagnosis.

Since this is a rather high percentage of visits which should have grouped into a procedure AVG but which did not, the problem was examined in much greater detail. Previous experience with the 1985 hospital OPD five percent sample file and the AVG program had indicated that rotating the diagnoses in visits with more than one diagnosis was not useful. This was, therefore, not done in the Fiscal 1988 analysis.

Four basic reasons for the AVG program not accepting valid ambulatory surgery procedures into procedure groups were revealed. Briefly summarized, these were:

- The AVG program, written for 1985 CPT-4 coding, did not accept new technology coded for the first time in 1987 CPT-4 series.
- Codes which changed between 1985 and 1987 were misassigned.
- Certain diagnostic and procedure combinations were not acceptable to Yale but are present in large quantities on the HCFA billing file.
- Certain vague CPT-4 codes are not acceptable to Yale but are present on the file.

When the Brandeis work was completed, only 6.9 percent of total billed charges remained outside of procedural AVGS. The Brandeis team made the decision to leave these remaining procedures in a mismatched category (similar to DRG 468, the DRG for cases where the procedure does not agree with the diagnosis) pending a HCFA decision to actually implement AVGs as the reimbursement mechanism for a case-mix-based prospective payment system. Health Systems International will be doing the actual revision of the AVGs, using the Brandeis work reported on here.

The vast majority of the 208 AVGs are present in the Fiscal 1988 hospital OPD billing file. Only 10 ambulatory surgery AVGs had no observations in the data. An additional 7 ambulatory surgery AVGs were not applicable to the Medicare population. There are 57 procedural AVGs that are not considered to be ambulatory surgery. (Ambulatory surgery is defined by CPT-4 procedure codes in the 10000-69999 range.) Most of these procedural AVGs represent diagnostic, non- invasive procedures performed by medical subspecialists or radiologists. One quirk in the current AVGs system has therapy performed by board certified psychiatrists, but not by other physicians, classified as a procedure. HCFA and the Health Systems International Advisory Committee should carefully examine the reimbursement incentives for these 57 "procedural", non-invasive AVGs with the thought that many of them can be collapsed back into medical categories.

FINDINGS: THE MOST IMPORTANT AVGS

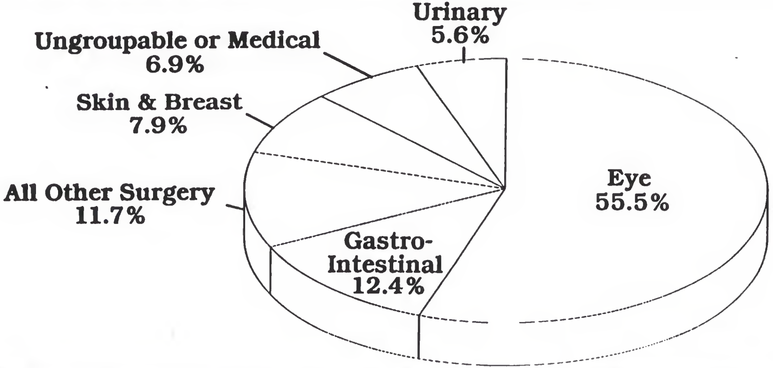
This section discusses the preliminary results of classifying Medicare visits using the AVGs. Emphasis is placed on those AVGs that are most important in terms of volume of visits combined with total billed charges. The following section will explore the potential use of AVGS as a classification tool to describe the unit of payment for ambulatory surgery performed by hospitals for Medicare recipients.

Figure 3 shows the distribution of AVGs by body system. Eye surgery accounts for 55.5 percent of the AVGs in total dollar volume; gastrointestinal surgery including scopes and hernia operations, for 12.4 percent; skin and breast surgery for 7.9 percent; urinary tract surgery, mostly cystoscopes, for 5.6 percent; and all other surgery for 11.7 percent. All other surgery includes nerve decompression, arthroscopy, D & C, prostate surgery, musculoskeletal system surgery, bronchoscopy, and bunionectomy. Ungroupable AVGs were only 6.9 percent of the total.

Figure 3

Distribution of Total Dollar Volume for Fiscal 1988

Ambulatory Surgery Procedures Performed in Hospital OPDs



The ten most expensive AVGs in terms of dollar volume to HCFA in Fiscal 1988 were:

AVG Number	AVG Description	Total Dollar Volume	Percent of Total
0242	Eye Procedure, anterior segment, cataract	$1,246 million	50.7%
1140	Cystoscopy, class I	96 million	3.9
0653	Endoscopy, upper G.I. tract, class III	61 million	2.5
0644	Endoscopy, colonoscopy, class II	52 million	2.1
0646	Endoscopy, colonoscopy, class IV	47 million	1.9
0658	Hernia repair	47 million	1.9
0645	Endoscopy, colonoscopy, class III	44 million	1.8
1342	Breast procedure, class III (excision of fibromas)	34 million	1.4
0152	Nerve decompression, class II	32 million	1.3
1341	Breast procedure, class II (incision and drainage)	32 million	1.3

These ten AVGs alone represented more than two thirds (68.8 percent) of all Medicare's ambulatory surgery. The projection to the entire Medicare population, totalling $2.457 billion was done as follows:

- Total billed charges for the hospital facility component of ambulatory surgery for the 65 and over Medicare population was estimated at $1.748 billion in Fiscal Year 1985.
- A ten percent inflationary increase was assumed for 1986, an additional ten percent for 1987, and an additional ten percent for 1988.
- A 5.6 increase was added for the under 65 disabled population, who were not included in the 1985 analysis.
- The result was approximately $2.5 billion.

Details on volume of visits and on mean billed charges are contained in the unabridged report. The coefficient of variation for cataract surgery was 0.37, with other coefficients of variation for the surgical AVGs generally under 1.00. The classes of visits shown in the leading ten AVGs are Yale's attempt to introduce a severity factor into the AVG system. This is discussed in extensive detail in the unabridged report and in the next section of this report. Basically, the complexity system does not work optimally on hospital facility data since it was designed for physicians time rather than hospital outpatient department costs.

POLICY IMPLICATIONS OF DEVELOPING A PROSPECTIVE PAYMENT SYSTEM FOR HOSPITAL BASED AMBULATORY SURGERY

A case-mix based payment system for outpatient care will have several components. First, visits need to be categorized. AVGs were created with this purpose in mind. Next, the relationship of one category to another in terms of resource use must be established. A case mix based payment system will attempt to measure the differences in complexity and severity across visits. Yale has designed the procedure AVGs so that many of them are distinguished by levels of complexity.

The following section of this paper examines resource use by class for the leading AVGs. Next the disadvantages of using CPT-4 coding alone in designing a prospective payment system are discussed. This section also presents and discusses the relative values for the AVGs. These relative values, or "weights", will already be familiar in concept to users of the DRGs. In the case of ambulatory surgery, the mean total billed charge of $908 for all ambulatory surgery visits is taken as unity. Thus, a relative value of 2.0000 for a particular AVG would imply that visits of this type consume twice as many resources as the average for all surgical visits. In addition, this section tests whether the AVGs group together visits that use similar quantities of resources.

Complexity and Severity

The Yale clinicians who designed AVGs divided many procedures which were very similar to each other into different AVGs, based on differing complexity and resource use. Thus, class I represents the least expensive set of procedures, class II the next most expensive, and so on. Scopes and skin procedures are the most common procedural ambulatory visit groups which are divided into classes. It should also be remembered, of course, that the AVGs were designed for the entire outpatient population and are not fully utilized when applied only to Medicare beneficiaries. Yale designed the AVGs for the physician component of ambulatory care rather than the hospital component. This generation of AVGs might therefore be expected to perform less than optimally when applied to the facility rather than the physician to measure resource use.

The concept of severity of illness usually refers to the prognosis of the patients disease or condition. A better way of describing the Yale system of classes for AVGs would be to say that they measure the complexity of the visit. This complexity issue is particularly relevant to HCFA's decisions regarding whether hospitals treating more complex cases require higher payments for services. Specialty hospitals such as eye and ear hospitals are one example of facilities that may be targeted for special payment provisions.

It is impressive that the Yale clinicians were able, for the most part, to form groups which correlate well with hospital facility charges even though the resource use measures available to them were primarily physician time. Colonoscopies, upper GI endoscopies, excision of skin lesions and foot and ankle procedures move smoothly from lowest to highest class, each showing increasing resource use. For example, excision of skin lesions moves from class I at $298 through classes II and III at $459 and $609 to class IV at $1,104.

Other groups of classes, particularly breast procedures, do not show much variation in hospital facility charges across classes. (The five classes for breast procedures range only from $944 to $1,127). These could almost certainly be collapsed into one category or at most two. Arthroscopies also show little variation across classes. A few procedures go in the wrong direction by class. Health Systems International and the Advisory Committee, which includes the designer of AVGs, Robert Fetter, will be addressing this issue in greater detail.

Disadvantages of Simply Using CPT-4 Coding for a Prospective Payment System

As previously noted, AVGs use the procedure coding system called CPT-4 developed by the American Medical Association to identify specific procedures. One option for Medicare is to simply use the CPT-4 codes instead of the more sophisticated AVGs. For the 25 most important CPT-4 codes, the average charges range from $148 for a simple repair of a wound to $2,059 for a cataract removal with lens insertion. This is similar to the range of the average charges for the leading AVGs. These 25 CPT-4 codes account for 72.7 percent of the dollar volume for ambulatory surgery in hospitals, about 7 percent less than the 25 most important AVGs. Since the AVGs aggregate CPT-4 codes together into a single AVG category, the percent of the dollar volume accounted for by these 25 CPT-4 codes is surprisingly high. The coefficients of variation for the codes are slightly lower than for the AVGs, as would be expected.

The major drawbacks to the use of CPT-4 codes in designing a prospective payment system for ambulatory care are at least threefold, however:

- The remaining 25 percent of visits with surgery are spread over close to 2,000 CPT-4 codes.
- There is no easy way using CPT-4 to handle visits with more than one procedure.
- CPT-4 does not take account of diagnosis and therefore cannot be expanded to medical visits.

CPT-4 codes do, however, have at least one highly appealing aspect from a short term policy point of view. As an interim measure to implementing a full-scale prospective payment system for hospital outpatient departments, HCFA must pay hospitals and free-standing surgi-centers using a "blended rate" for the facility component of these types of organizations, both of which groups perform ambulatory surgery. Surgi-centers are considerably cheaper than hospital OPDs, so that the promulgation of this regulation results in a loss to hospitals. Currently, the calculation of the "blended rate" is based upon six broad categories of CPT-4 codes, grouped together on the basis of similarities in resource use, rather than for medical reasons. While this method may possibly work short range, it is difficult to see how the requirement to place all hospital outpatient department visits under a prospective payment system by 1991 can be compatible with an approach limited to CPT-4 codes.

Simplified AVGs as a Reimbursement Mechanism

The findings reported previously have demonstrated that a relatively small number of the 208 procedural AVGs capture the vast majority of ambulatory surgery performed in a hospital setting for Medicare beneficiaries. To the extent that the AVGs are to be considered for payment for outpatient surgery alone (i.e., not as a part of a larger AVG based payment reform for more settings), a greatly simplified version of the AVG approach might be phased in first. Not only might the AVGs inappropriate to ambulatory surgery be entirely eliminated, but those with fewer than a certain minimum number of visits might be collapsed into a single AVG. This would provide the basis for a prospective payment system with only a few AVGs for the entire Medicare population. Using a limited number of AVGs would provide a considerable simplification of the present system while still leaving the door open for a potential system based on a modification of the complete set of medical and surgical AVGs.

From an administrative point of view, this has obvious appeal. If this simplification is not done, the less common procedural AVGs could be difficult to price accurately given the limited number of observations for Medicare. Simplification of the AVGs has few drawbacks. One is that severity (intensity of service) as measured by the classes for similar procedures, is sacrificed. It has already been seen, however, that changes in dollar amounts are frequently not great, and that individual classes contribute little to the overall bill. A slightly more complicated version of a small set of procedural AVGs would retain the classes for those procedures with high volume.

The appeal of both types of simplification rests entirely on the assumption that an AVG based prospective payment system will be used only for Medicare and, furthermore, only in the hospital outpatient setting. If instead, Medicare wishes to develop a payment system for all of hospital-based ambulatory care, more of the complete set of AVGs could well be needed. Once other settings and other third party payers are involved, approximately 100 to 150 AVGs may well be needed. Accepting the old patient/new patient dichotomy (although Brandeis recommends against this) could increase the number still more. This issue may be of considerable importance since, for example, many DRGs, while inapplicable to the Medicare population, are used by twelve states for Medicaid reimbursement as well (Hellinger, 1986).

Weights for the AVGs

The overall average charge for a hospital outpatient visit for ambulatory surgery was $908 in Fiscal 1988. However, wide variation exists among average charges for the high volume AVGs. For example, the average for lens procedures is $2,026, more than twice the average; while the average for the next most common procedure group, class III endoscopies, is $393, less than half of the average. The range of average charges for common AVGs is considerable, from a high of $2,026 for lens procedures to a low of $162 for repair of skin injury (AVG 2144). (Ninety five percent of repairs of skin injuries take place in the emergency department.)

This means that the AVGs are separating visits into categories that are quite different from each other. In turn, this implies that payment based on (e.g.) only 25 AVGs would distinguish outpatient departments which perform simple ambulatory surgery from those specializing in the more resource intensive ambulatory surgery. If this were not true, then AVGs would not be useful as a basis for payment for these facilities.

The coefficient of variation (CV) is the standard deviation of the charges divided by the mean. This statistic is a summary measure of the homogeneity of the visits in a single AVG. A low CV means that the charges in the AVG were quite similar while a high CV implies that the charges varied greatly. The CV is useful as an indicator of the risk that is transferred from Medicare to the provider when the provider is paid a fixed price for a visit in a given ambulatory surgery category. From the providers' viewpoint, low CVs are desirable because this means that the AVG is a good predictor of the resources that will be needed to perform the particular surgical procedures. Thus, the risk for the provider in accepting a fixed price for one of these visits is low. From the point of view of the Medicare program, however, the differences in the mean charges can be more important than the homogeneity of AVGs as measured by the coefficient of variation. It is the difference in mean charges across the AVGs which assures Medicare that hospitals providing different case mixes of ambulatory surgery procedures will be paid differently.

The CVs for the 25 leading AVGs range from a low of 0.37 for lens procedures (overwhelmingly the most common AVG) to a high of 1.21 for a Class IV eye procedure. The CVs are actually lower than the CVs for the DRGs used for Medicare's inpatient prospective payment system (Frank and Lave, 1985). The CV for all visits for ambulatory surgery which are not represented in the leading 25 AVGs is 0.91, well within the overall DRG range. This finding supports the concept of a simplified AVG system. The actual details of the coefficients of variation are available in the unabridged version of this report.

Some of the variation within the AVGs is due to the fact that the AVGs were developed using physician time as the major dependent variable. For this policy analysis paper, the AVGs were applied to charges for the facility, not the physician. In addition, it is important to note that the diagnostic and procedure data from the HCFA Fiscal 1988 hospital OPD file were not used to compute payment to hospitals. Thus, providers and fiscal intermediaries have not yet been motivated to improve their data reporting to optimum levels. Also data have not been trimmed at three standard deviations above the mean as was the case for DRGs. For all these reasons, the above estimates of the coefficients of variation for the AVGs are upper bounds for the true values.

With all of these caveats in mind, Brandeis has provided weights for four sets of AVGs. The table shown in this abridged report (Table 1) includes the AVGs accounting for at least one half of one percent of total billed charges. These encompass 25 AVGs plus an additional two weights for "other" categories. These "other" categories are all other procedural AVGs combined and an "AVG" for visits with mismatched diagnoses and procedures. This table is organized from the most to the least expensive category. The remaining sets of weights for the three larger sets of AVGs are found in the unabridged version. A complete set of ambulatory surgery weights would comprise 186 AVGs, representing 93.1 percent of all ambulatory surgery in dollar volume (the remaining 6.9 percent is accounted for by medical AVGs which Brandeis has not converted). The weights range from a low of 0.1409 for application of a small splint to a high of 11.2291 for insertion of a ventricular pacemaker. This is a one hundred fold difference, rather than the twenty fold difference found using the most common AVGs as shown in Table 1.

Of particular note are four new AVGs which Brandeis has created for very high cost procedures. These procedures were apparently not done outpatient when Yale created the second generation of AVGs in 1985. These procedures are insertion of a ventricular pacemaker, insertion of a pulse generator into a pacemaker, lithotripsy, and cardiac catheterization. While there were only about 2,000 hospital OPD visits for these procedures in 1987, they bear watching because of their very high charges. Cardiac catherization has, in fact, been the subject of a recent controlled study examining its safety on an outpatient versus an inpatient basis on patients as old as 75 (Block et al., 1988).

The new AVGs formed by Brandeis to accommodate very expensive new high technology procedures are:

Yale Medical AVG	CPT-4 Code	New Surgical AVG	Procedure Name
0500	36230	05P3	Cardiac catheterization
0507	33207	05P1	Ventricular pacemaker insertion
0507	33212	05P2	Replace pulse generator
1102	50590	11P1	Lithotripsy for urinary stones

Table 1

Preliminary Weights For AVGs Accounting For At Least One-Half of One Percent Of Medicare Total Billed Charges, Fiscal 1988

AVG . Number	AVG Description	Mean Billed Charges	Relative Value - Weight
0249	Eye procedure, anterior segment, class V (cornea transplants)	$2,216	2.4410
0242	Eye procedure, anterior segment, cataract	2,026	2.2314
0868	Foot & ankle procedures, class IV	1,604	1.7662
0880	Arthroscopy, class II	1,558	1.7160
0658	Hernia repair	1,293	1.4238
1141	Cystoscopy, class II	1,023	1.1263
1342	Breast procedure, class III (excision of fibromas)	991	1.0912
1341	Breast procedure, class II (incisions & drainage)	985	1.0850
1349	Other surgery on female reproductive system (D & C)	913	1.0059
0152	Nerve compression, class II	889	0.9790
0341	Bronchoscopy, class II	844	0.9299
1253	Other surgery, male reproductive system (prostate biopsy)	828	0.9116
0873	Other surgery, musculoskeletal, class II	807	0.8891
1140	Cystoscopy, class I	625	0.6883
0248	Eye procedure, anterior segment (photocoagulation and laser) class IV	625	0.6883
0942	Excision skin lesion, class III	609	0.6703
2646	Endoscopy, colonoscopy, class IV	502	0.5524
0941	Excision skin lesion, class II	459	0.5057
0645	Endoscopy, colonoscopy, class III	422	0.4647
0644	Endoscopy, colonoscopy, class II	402	0.4431
0654	Endoscopy, upper GI tract, class IV	399	0.4397
0653	Endoscopy, upper GI tract, class III	393	0.4326
0240	Laser eye procedures, anterior segment	303	0.3345
0940	Excision of skin lesion, class I	298	0.3279
0643	Endoscopy, colonoscopy, class I	247	0.2718
PERCENT OF TOTAL BILLED CHARGES ACCOUNTED FOR BY THE TWENTY-FIVE AVGs IN THIS TABLE			**79.4 %**
OTHER PROCEDURAL AVGs		**547**	**0.6024**
MISMATCHED AVGs (diagnosis does not match procedure)		**606**	**0.6674**
MEAN BILLED CHARGES FOR ALL VISITS		**908**	**1.0000**

Including the creation of the four new AVGs, there are actually seven AVGs with mean billed charges greater than the $2,026 charge for cataract surgery at $2,026. While small in total volume at present, all of these AVGs represent the cutting edge of the new technology and thus bear watching. The AVGs in question are:

AVG Number	AVG Description	Mean Billed Charges	Weight
05P1	Ventricular pacemaker	$10,196	11.2291
05P2	Pulse generator	6,327	6.9681
1248	Penis prothesis (inflatable)	5,083	5.5984
11P1	Lithotripsy	4,850	5.3650
1247	Penis prothesis (non-inflatable)	3,022	3.3285
05P3	Cardiac catherization	2,541	2.7984
0249	Operation on anterior segment of eye, other than cataract	2,216	2.4410

All weights are relative values; relative to the mean billed charges for an average visit in the last three months of 1987. That is, the weights express the resource intensity of a particular AVG relative to the resources required for the average ambulatory surgery visit for Medicare. Thus, a weight of 2.2314 for cataract removal,shown in Table 1, means that the AVG is expected to require slightly more than twice the resources needed for the average visit. Similarly, a weight of 0.4647 for colonoscopy means that these visits used about one half of the resources needed for the average visit. Using relative values simplifies budget neutrality and facilitates adjustment calculations.

Possible Resource Use Measures to Calibrate AVGs

Just as DRGs were first developed using length of stay as the original dependent variable and were later recalibrated using costs and then charges, there is to some extent a choice of alternative resource measures for ambulatory surgery AVGs as well. Minutes of operating room time could be considered, although these are certainly inferior to total billed charges, and are in fact unusable for procedures such as scopes which do not require operating room facilities. An attempt to modify total billed charges into allowable charges or even into "costs" might be made. While this may or may not result in smaller coefficients of variation for the AVGs, it is not expected that it would substantially change the relative value of a given AVG as compared to all other AVGs, and the process of converting charges to costs could add error to the data.

A more intriguing possibility is to use the CPT-4 weighting scheme currently being developed at Harvard School of Public Health by William Hsiao (Hsiao et al., 1988). This weighting scheme or resource-based relative valve scale (RBRVS) was developed by measuring three resource costs intrinsic to the production of physicians services: the time and intensity of work; practice costs; and the opportunity costs of specialty training. The Harvard weights are being designed for the physician component of care but might possibly be usable for the facility component as well, at least to the extent that surgeon, anesthesiologist and other physician time correlates with facility resource use. Since the CPT-4 based payment system for physicians appears to be here to stay (Iglehart, 1988), the possibility of using the Harvard weights to augment total facility charges to include physician's bills in the hospital AVGs is a reasonable longer term option. If AVGs are used to pay for the facility component of hospital-based ambulatory surgery, this potential expansion to include physician's services might be further explored. That is, a logical extension of the facility payment system based on AVGs would involve bundling in the physicians' component of the bill. Including surgeons' fees in an all inclusive ambulatory visit group prospective payment system is, however, almost certainly not politically feasible at the present time.

CONCLUSIONS

The results of this evaluation of the utility of the AVGs for payment for surgery performed in hospital outpatient departments are quite encouraging. Despite problems, the AVGs were able to classify most of the cases. The mean charge across the leading 25 AVGs had about a twenty fold range, implying that relative values for the AVGs will be quite distinct from each other. This indicates that the AVGs will be able to distinguish among facilities based on their ambulatory surgery case mix. Coupled with the potential utility of the AVG approach for medical visits in hospital OPDs and across settings such as ambulatory surgery centers, this represents a strong argument in favor of the AVG classification system.

Of course, the AVGs are not perfect in this regard. The overall number of AVGs is quite large, larger even than the number of DRGs. The number needed to categorize the majority of Medicare visits for ambulatory surgery in the OPD setting is, however, quite small.

A greatly simplified subset of AVGs may be all that is required for initial implementation of a prospective payment system, if this is done at first only for ambulatory surgery in a hospital setting for the Medicare population. Since the evident potential of the AVGs may lead to their use in other settings as well as to their consideration as a component of a larger physician payment reform effort, it is premature to suggest what the permanently reduced set should look like at this time. While the possibility of using less than 50 AVGs to classify all of Medicare hospital-based ambulatory surgery is appealing, it needs further investigation. Development of a smaller set of AVGs is now under way, as previously described. A large part of the appeal of the AVGs is precisely because the entire AVG system could be implemented in stages beginning with ambulatory surgery and eventually embracing all of hospital outpatient department care.

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APPENDIX E:

New York State Ambulatory Care
Case Mix Project
The Products of Ambulatory Surgery
Research Summary

New York State Department of Health

NEW YORK STATE AMBULATORY CARE CASE MIX PROJECT

THE PRODUCTS OF AMBULATORY SURGERY

RESEARCH SUMMARY

New York State Department of Health
Division of Health Care Financing
Bureau of Ambulatory Care Reimbursement

Health Research, Inc.
Project # 11-C-98574/2

This paper is prepared as part of a cooperative agreement between the New York State Department of Health and the Health Care Financing Administration (Grant # 8142152E)

EXECUTIVE SUMMARY

The New York State ambulatory surgery study goals are two fold: 1) conducting research and reimbursement modeling for the Federal Health Care Financing Administration (HCFA), and 2) concurrently exploring alternatives for a New York State Medicaid payment system for ambulatory surgery. A single activity will serve both goals. Using original data representing over 225,000 operations included in the New York State's Ambulatory Surgery Data Abstract Project (ASDAP) data base, professional expertise, work measurement studies, and fee schedules, the Project will analyze, classify, and price ambulatory surgery services in a modular format.

The ASDAP data base was evaluated and found to be superior to other available data sources. The use of ASDAP variables reflecting actual resource use eliminated many of the problems encountered by other research teams dependent on charged based data. Management engineering studies will validate and supplement the ASDAP data. Using statistical analysis and clinical expertise from a cross section of surgical specialties, the Products of Ambulatory Surgery (PAS) classification system will be evaluated and revised as necessary.

A resource use model was developed for the classification system. This model provides standard costs for each procedure, which can be used to determine payment levels.

INTRODUCTION

The New York State Ambulatory Care Reimbursement Project, (supported by a research demonstration cooperative agreement with the Health Care Financing Administration) developed and is testing a classification system for hospital and freestanding clinic based ambulatory care as a pilot Medicaid payment system. The classification and reimbursement demonstration is known as Products of Ambulatory Care (PACs). Building on this experience New York State initiated an examination of ambulatory surgery services and the application of a product based classification system. The outcome of this investigation is the Products of Ambulatory Surgery (PAS) classification system.

Although ambulatory care and surgery occur in different settings, often for different services and patients, some services and patients are shared. Given these similarities and the ability to adapt research approaches for data collection and classification, as well as a need for similar explorations of implementation strategies and policy incentives, many features of the previous PAC research were adapted for use in the ambulatory surgery investigation. This extension of the NYS Project's efforts into ambulatory surgery also brings a potential for linking the ambulatory surgery and ambulatory care information to improve efforts aimed at classifying, tracking, and paying for continuums of care.

New York's Conceptual Approach to Ambulatory Surgery Research and Model Development

The Products of Ambulatory care (PACs) classification system is based on the concept of bundling related medical services into an ambulatory care payment unit including both provider and ancillary services related to a visit. The research undertaken to create an ambulatory surgery classification scheme has similarities with the project's earlier work:

- Both create a cohesive set of service "bundles" applicable regardless of setting (hospital based or freestanding);
- Both define the unit of service or "product" by a combination of patient and service characteristics;
- Both use standardized weights to measure the differential resource use values for each "bundle" or "product"; and,
- Both define resource use as all labor, routine ancillaries and key technologies employed during the unit of service (visit or procedure). PAS though does not include the surgeon or anesthesiologist's value in the labor measurement.

The definition ambulatory surgery continues to evolve Ambulatory surgery is elective in nature, scheduled and planned. It comprises a range of surgical procedures (300-500) that by standard and the most specific nomenclature available (ICD-9 or CPT-4) would be identified as the same whether done outpatient or inpatient basis.

The grouping of services into homogeneous bundles is the first step required in the development of a casemix related payment system. Management science innovations and related concepts are changing the organization, payment, and delivery of health services. At this point the most influential among these innovations is the product concept. A good product definition will represent a useable aggregation of the inputs, and the processes used to transform those inputs, into a homogeneous bundle of services, a product. The advent of Diagnostic Related Groups (DRGs) spurred a radical transformation in the language, accounting, research and planning of inpatient services. The same organizing principles can be introduced to ambulatory surgery and when adopted by public payors will likely stimulate acceptance throughout the health care industry.

It is almost always an invasive procedure whether through the use of surgical instruments, lasers, or diagnostic apparatus (scopes). The procedures are typically more routine and present less risk than inpatient procedures and are performed on patients who do not manifest characteristics which indicate adverse surgical outcomes. They are performed in a variety of settings (i.e., surgery suites or exam rooms in hospitals, clinics, freestanding centers, or physician offices) however, the procedures require a similar room and basic equipment. The patients are generally more healthy than their inpatient counterparts and are able to ambulate. The use of a recovery room, sterile equipment, sedation or anesthesia, a low risk of the need for subsequent inpatient services, and the organization of services by specialties are also characteristics of ambulatory surgery.

Despite these similarities, variance is introduced by both the length of time required to complete the procedure, and the patterns of practice. The length of a procedure can be measured and analyzed whereas differences in practice patterns manifest themselves in more subtle fashion. Practice pattern differences can be seen by looking at the types of pharmaceuticals and anesthesia as well as the techniques and technologies used by the physician. The potential influence of practice on product definitions requires the flexibility to adjust to changing medical practice and its associated technological advances. Ambulatory surgery, more directly than most ambulatory services, is affected by the inpatient environment and related practice and technological changes. This characteristic infers a only temporary fit to any universal listing of ambulatory procedures, appropriate patients, or settings.

In general, product definitions should include as many integral elements as possible. Interdependency among elements is the key to inclusion in a product definition. To the extent possible, the product should include all those elements which are influenced by the casemix. In the case of ambulatory surgery this would mean special equipment, personnel, pharmaceuticals, prosthetics, as well as the fixed material and resources required for any procedure. These resources, when classified would form the basis of an appropriate product definition.

Although nearly any level of service, payment unit or coding nomenclature can be viewed as a product, most fail to meet all the criteria for a homogeneous casemix adjusted service group or product.

In development of PACs as well as PAS, five criteria were followed to insure operational success with ambulatory care classification schemes.

CLINICAL MEANINGFULNESS By incorporating pertinent patient characteristics and also clinical practices into the product definition, resource use patterns which are primarily influenced by those two factors are more accurately reflected. In addition, clinical utility enhances provider acceptance and eases implementation.

HOMOGENEOUS GROUPS The classification system should result in products which explain most of the resource use differences or variance. Regardless of the dependent variable used in their construction (i.e. charges, operating room time, or other resource surrogates) the products, when used for payment, should minimize the variance of all casemix related resources or costs. The groups should also represent a standard product which can be identified across settings. This feature will allow policymakers to contrast and compare competing alternatives.

FINANCIAL EQUITY Payors must balance equity, flexibility, and risk in their payment systems. Financial equity can be assessed by analyzing the comprehensiveness of the resources, the accuracy in predicting their associated costs and the timeliness of their measurement. By including all casemix related resources an accurate system will be capturing all casemix related costs. Equitable payment to the provider of services are rates which reflect the reasonable costs for the resources expended to fashion the product. The accuracy of measures used to determine casemix and consequently payment can decrease as the time between measurement and payment grows. To eliminate such inequity, payment should be made on the basis of per unit, real time, measures rather then cumulatively average costs or, on the basis of periodically measured indices.

FLEXIBLE The patients and physician practice patterns which influence ambulatory surgery resource use are dynamic. It is important to incorporate flexibility into a classification system because over time dramatic changes in practice patterns are likely to occur. The system should be capable of change without requiring total revision.

ADMINISTRATIVE SIMPLICITY The system should be as simple as possible so that the administrative burden of its implementation and operation is consistent with existing billing and coding methods. A minimum feasible number of groups can ease administration. When the payment units are excessively discrete and thus numerous, artificial upcoding of resource values becomes possible. To mitigate the possibility of upcoding, payment units should be as inclusive of resource inputs as possible while maintaining group homogeneity.

Products of Ambulatory Surgery Investigation

The New York State ambulatory surgery investigation can be summarized by four interdependent research efforts involving: The appropriate definition of ambulatory surgery; The classification of ambulatory surgery; Resource use verification; and the establishment of prices

These efforts when fully completed will result in the creation of a cohesive system which bases reimbursement, regardless of setting, on a similar set of product definitions. The creation of service bundles (i.e. products) usable in both clinic and ambulatory surgery environments can result in greater equity system-wide. The results of this research combined with PAC development activities should eliminate some of the perverse incentives found in the present fragmentary reimbursement system.

The PAS case mix based prospective payment system for ambulatory surgery can replace existing approaches used to pay for these services. These existing approaches include cost based payment, complex fee schedules that identify rates for every procedure and simplified fee schedules that group procedures into 4 to 6 categories. The construction of the PAS (Products of Ambulatory Surgery) classification system and the development of a resource use model for facility costs are near completion. It is anticipated that these components will enable New York State to create based on a meaningful classification system a prospective, modular price payment system for facility related costs.

New York has a unique data base which is comprised of all ambulatory surgery procedures performed in facilities since 1982. Research using the Ambulatory Surgery Data Abstract Project, (ASDAP) has yielded the Products of Ambulatory Surgery (PAS). Using major body systems as the rows of a matrix and dividing procedures into three major service columns, diagnostic, therapeutic, and reconstructive, produces a set of 36 Products of Ambulatory Surgery. Using these groups, overall resource variance is reduced, dissimilar procedures are separated, and similar procedures are combined.

Clinical input has been, and will continue to be integral to data interpretation, understanding relevant protocols, and formulating resource values. Project staff are closely working with twenty surgeon consultants representative of the surgical and medical specialties active in ambulatory surgery.

Management engineering techniques are used to augment and validate the ASDAP data. To develop empirical resource data, operating room times were combined with observation and the on-site measurement of resources used during the procedure including equipment, drugs, anesthesia, prosthetics, disposable supplies, space and labor. This detailed accounting in combination with extensive clinical input offer the opportunity to develop a progressive and equitable facility reimbursement system for these services.

PAS DEVELOPMENT

Definition

Exhibit 1
PAS DRAFT AMBULATORY SURGERY CLASSIFICATIONS (NYSDOH 88)

<table>
<tr><th></th><th>RX</th><th>DX</th><th>REC</th></tr>
<tr><td>Eye</td><td>X = 36
N =2677
CV = 70</td><td></td><td>X = 66 | X = 81
N =25272 | N = 1729
CV= 34 | CV= 36</td></tr>
<tr><td>Ear</td><td>X = 42 | X = 21
N = 979 | N = 7854
CV = 54 | CV = 55</td><td></td><td>X = 79
N = 608
CV = 56</td></tr>
<tr><td>Nose/ Throat</td><td colspan="2">X = 39
N =10164
CV = 48</td><td>X = 80
N = 2632
CV = 49</td></tr>
<tr><td>Oral</td><td>X = 57
N = 4413
CV = 53</td><td></td><td>X = 109
N = 304
CV = 43</td></tr>
<tr><td>Nerve</td><td>X = 52
N = 5683
CV = 42</td><td></td><td></td></tr>
<tr><td>Upper GI</td><td colspan="2">X = 28
N =10249
CV = 57</td><td></td></tr>
<tr><td>Lower GI</td><td colspan="2">X = 43
N =12760
CV = 60</td><td></td></tr>
<tr><td>Rectal</td><td colspan="2">X = 34
N = 7569
CV = 46</td><td></td></tr>
<tr><td>Abdomen</td><td colspan="2">X = 49
N = 3884
CV = 38</td><td>X = 62
N = 6162
CV = 38</td></tr>
<tr><td>Skin</td><td colspan="2">X = 37
N =19842
CV = 52</td><td>X = 71
N = 2949
CV = 52</td></tr>
<tr><td>Breast</td><td colspan="2">X = 48
N =11274
CV = 39</td><td>X = 95
N = 640
CV = 39</td></tr>
<tr><td>Vascular</td><td>X = 48
N = 1101
CV = 42</td><td>X = 51
N = 1655
CV = 43</td><td>X = 80
N = 413
CV = 48</td></tr>
<tr><td>Bone</td><td>X = 51
N = 4846
CV = 48</td><td colspan="2">X = 68
N = 5152
CV = 49</td></tr>
<tr><td>Muscle</td><td>X = 54
N = 6704
CV = 48</td><td></td><td>X = 75
N = 8238
CV = 42</td></tr>
<tr><td>GYN</td><td colspan="2">X = 37
N = 7103
CV = 51</td><td></td></tr>
<tr><td>D & C</td><td>X = 27
N =24491
CV = 49</td><td></td><td></td></tr>
<tr><td>Ovary</td><td colspan="2">X = 48
N = 7501
CV = 39</td><td></td></tr>
<tr><td>Male</td><td>X = 44
N = 4779
CV = 45</td><td>X = 29
N = 1256
CV = 46</td><td>X = 77
N = 514
CV = 43</td></tr>
<tr><td>Urology</td><td>X = 31
N = 3021
CV = 49</td><td>X = 24
N =11152
CV = 53</td><td>X = 124
N = 119
CV = 41</td></tr>
</table>

Rx - Therapeutic Surgical Procedures

Dx - Diagnostic Surgical Procedures (Scopes & Biopsies)

Rec - Reconstructive Surgical Procedures

Sample:
Mean = x = 45
CV = Coefficient of Variation = measure of dispersion = 60

Size = N=225,689

Range= 21-124

Reduction in Variance= 37%

X = OR Time
N = Number of Surgeries
CV = Measure of Relative Spread
↓ Tighter
↑ More Spread

For purposes of this study, the term "ambulatory surgery" is defined in New York State regulations as hospital based and freestanding programs organized to provide surgical procedures which need to be performed for safety reasons in an operating room on anesthetized patients requiring a stay of less than 24 hours.

The investigation differentiates and excludes those outpatient surgical procedures which can be performed safely in a private physician's office or in an outpatient treatment room of a hospital or freestanding clinic. To insure that the above definition is sufficient and feasible, an analysis of the patients. services, and settings into which procedures common to both ambulatory care and surgery was undertaken.

Data Base

The quality of the Project's analysis is predicated on the quality of the ASDAP data. Therefore a brief discussion of ASDAP data, and its validity is indicated.

The following variables were among those available for analysis from the ASDAP data base:

ZIP CODE
DOB
SEX
FACILITY IDENTIFIER
PRINCIPAL DIAGNOSIS CODE(ICD-9CM)
PRINCIPAL PROCEDURE CODE(ICD-9CM)
OTHER PROCEDURE CODE
OPERATING ROOM TIME
DATE OF SURGERY SERVICE
DISPOSITION
PRIMARY PAYOR
PATIENT COUNTY OF RESIDENCE
METHOD OF ANESTHESIA
DIAGNOSTIC RELATED GROUP (DRG) DESIGNATION

Using a subset of 1987 ASDAP data, an initial data tape was created which consisted of 275,000 observations. The data was cleaned and trimmed. This process involved the paring of all procedures with a frequency of less than 28 observations and trimming time outliers using Tukey's statistical outlier definition. The resulting data base contained 235,000 observations, of which approximately 10,000 had procedure codes deemed non-surgical. The resulting data base consisted of 225,689 observations.

Brandeis University and The Urban Institute are conducting related research using a five percent Medicare paid claims sample. Frequencies within the ASDAP 65+ subset were compared with the data from both Brandeis and the Urban Institute. High rank order correlations between the top procedures in the ASDAP age 65+ subset and the Brandeis and Urban Institutes data bases confirm both the validity and applicability of the New York data to HCFA analysis. Clinical consultants also provided ratification of good face validity.

Patient Classification

Prior to PAS development, several classification systems were already available for applications in ambulatory surgery; Medicare's four, or the newer six price groups, the ICD-9CM anatomy based procedure classification, Diagnostic Related Groups, and the Ambulatory Visit Groups.

The Medicare groups are based on 1979 procedure data. The resulting four group classification scheme was limited by data availability. Only 400 CPT4 procedures were approved at the time of the original study compared to the 1200 currently approved procedures. The resource measure for each procedure was the charge for the procedure at the sample sites. Charges are infamously poor indicators of true resource use. To avoid some of these problems, the HCFA analysis which developed the four price groups, and the recently revised six group metnodology, constructed an index derived from charge information. This standardized relative value was then used to compare and group procedures across facilities. At the time of its initial development, the Medicare approach represented the state of the art. However, neither Medicare grouping method, the old four group or the new six group method , incorporates clinical understanding. The present ambulatory surgery environment requires a more sophisticated approach capable of greater discrimination and a more accurate reflection of both resource use and clinical practice so that it may embody the changes in practice which influence the use of resources.

Initially, the ICD-9CM procedure coding was used to classify the ASDAP data. This analysis produced a reduction of variance for the dependent variable, operating room time, of 42% with 496 procedures represented. The procedure level is the most specific level within the data base therefore it would be impossible to reduce variance, by arraying procedures, more then 42% within this data base.

The Diagnostic Related Groups are an inpatient classification system familiar to clinicians. The DRG's are designed to represent inpatient practice patterns and patient characteristics not often duplicated in ambulatory surgery settings. DRG's are ICD-9CM based and require a computerized grouper. Within the ASDAP data base the 347 DRG's represented reduced variance by 33% with operating room time as the dependent variable.

Ambulatory Visit Groups were originally designed to classify physician behavior. They were later revised to encompass procedures related to ambulatory care. Within the AVG's procedures are aggregated by body system and subsequently divided into class levels. The AVG's are CPT-4 based. Presently there are over 570 of them, of these approximately half are applicable to ambulatory surgery. Since the ASDAP data base relies on ICD-9cm, a coding crosswalk from ICD-cm to CPT-4 is needed to assess the AVGs explanatory power for the dependent variable of operating room time. This work is underway at the time of this writing.

The PAS are the result of applying the anatomy based procedure groups to the ASDAP data. Using major body systems as the rows of a Matrix and dividing procedures into three major service columns, diagnostic, therapeutic, and reconstructive, produces a set of 36 Products of Ambulatory Surgery (Exhibit 1)

Using these PAS groups variance within the dependent variable, operating room time, was reduced by 37%.

RESOURCE USE

The PAS will ultimately group ambulatory surgery procedures for reimbursement. Within the parameters of clinical utility, the final groups will represent the best solution to minimize resource use variation within groups while maximizing the variation between groups. For this process, each ambulatory surgery episode must be valued in terms of the resources that are used. These resource values are the dependent variable for the study. In ambulatory surgery several options for a dependent variable exist: charges, relative value units, operating room time, labor types, anesthesia, recovery room time, ancillaries, special equipment, and prosthesis. The initial classification analysis was based on operating room time. Subsequently, anesthesia, recovery room time, labor, ancillaries, equipment, drugs and prosthesis have been added to operating room time within a resource use model. Unlike charge based information, variations in engineered measures of these resources reflect actual on-site observations rather then artifacts of accounting.

Once a dependent variable has been established, its response to independent variables must be examined. In ambulatory care there are any number of independent variables which might affect resource use, including location, provider type, patient demographics, disease processes, etc. However, in ambulatory surgery, these variables appear to have minimal influence. Provider type is closely correlated to a specific range of surgical procedures and therefore covaries with the use of a particular procedure's resources. Because any given procedure will require a specific environment and equipment, location also does not significantly influence differences in resource use, although regional differences may be accounted for by adjusting price levels for inputs such as rent costs or salary scales.

Four characteristics of ambulatory surgery need to be understood before a general model of resource use can be developed. These characteristics are: use of anesthesia in ambulatory surgery; degree of variation in ambulatory surgical practice patterns across facilities; limited incidence of surgical complications in ambulatory surgery; and differences between freestanding and hospital-based ambulatory surgery facilities.

Patterns of anesthesia use have changed in recent years in most settings. The procedures requiring general anesthesia have steadily declined. In fact, as the number of procedures performed on an outpatient basis increased, the number of procedures using general anesthesia decreased to as low as ten percent or less in some freestanding facilities. Variations in practice patterns affect this percentage. In facilities where traditional practice patterns continue the use of general anesthesia is higher. When local anesthetics are used, surgeons may provide anesthesia themselves, without the use of an anesthesiologist or a Certified Registered Nurse Anesthetist (CRNA). Such practices are more common in freestanding facilities and when they occur, they can have a substantial effect on the resources used in surgery.

It is also important to understand that ambulatory procedures are among the most routine surgical procedures. They are far less likely to vary, in terms of resources used, among facilities when compared to procedures that require an inpatient stay. Without question, surgeons vary in terms of their speed and perhaps, approach to surgery, but other aspects of ambulatory surgery are consistent across facilities, including pre-operative time, recovery time, equipment used and drugs and supplies used.

Not only are ambulatory procedures performed similarly, the conditions of patients who receive ambulatory surgical services are also similar. Although each patient may have a specific problem that requires surgery, they are at less risk of complications. This general good health that is common to all ambulatory surgical patients makes it easier to develop a general model of resource use since fewer outlier cases occur. Analyses of ASDAP data support the relatively low incidence of outlier cases.

Finally, it is important to understand the difference between ambulatory surgery performed in a freestanding facility and surgery performed in a hospital. Freestanding centers, because they are completely devoted to ambulatory activities, have simplified many operational aspects. Hospitals have approached ambulatory surgery differently. Although some hospitals have organized separate ambulatory surgical facilities, most have integrated inpatient and outpatient surgery by using the same pre-operative and recovery room areas. As a result, hospital-based facilities may have some differences when compared to freestanding facilities, but these differences are more related to traditions and patterns of practice than to the requirements or outcomes of specific surgical procedures. For this reason, it is preliminarily concluded that it is unnecessary to reflect these differences in the general model.

THE NEED FOR A MODEL

The effort to determine the costs of surgical procedures will be greatly aided by the creation of a general model of resources used in surgery. Modeling standard costs for each procedure will allow variable weighting of PAS categories by cost to arrive at payment levels. The creation of a general model will facilitate comparisons of costs across facilities and among surgical procedures within the same PAS category.

Building a general model of ambulatory surgery requires several specific steps. First, all resources used to provide surgery must be identified. Once the types personnel, supplies, equipment and other resources required for surgery have been identified, the amount of each resource needed for each procedure must be measured and priced. Unit cost and units of resources can then be used to arrive at standard costs. Each of these steps and the resulting model are presented in the next section of the report.

Resource requirements include:
- o Diagnostic tests
- o Personnel:
    - Surgeon
    - Anesthesiologist/CRNA
    - Nurse

    - Aide
    - Other

- o Anesthesia
- o Drugs
- o Disposable supplies
- o Other supplies
- o Prosthetics
- o Major equipment.

Surgical activities include:

- o Diagnostic reviews
- o Pre-operative activities
- o Operating room activities
- o Recovery room
- o Pathology.

Completion of the resource use measurement process required the project staff to collect data on resources used and unit costs. This work was performed in conjunction with the Center for Health Policy Studies, a subcontractor to the project. Resource use data collection was focused on observations of surgery at a sample of freestanding and hospital- based units and/or interviews with surgeons and anesthesiologists who are exceptionally experienced in ambulatory surgery. The data collection form used for observations is presented as Exhibit 2, on the following page. Although a small number of facilities have been used for observations, the uniformity in procedures that has been encountered has been noteworthy. There is no evidence that visits to a larger number of facilities would change conclusions substantially.

Unit cost data has been collected from purchase records of facilities that were visited and from manufacturers and distributors. Data on personnel costs, drugs, supplies and equipment have also been gathered.

In addition to specific data, a major finding from this activity was the remarkable uniformity across settings for each procedure and that sent us back to the PAS Classification.

For each of the 36 PAS groups the frequency distribution of surgical procedures was examined. We then identified the most frequent procedure(s) as our "Seed Procedure" for each group. (See exhibit 4). Every resource element used during that "seed" procedure was then itemized and a standardized value was applied. To validate the reasonableness of the values, the seed procedure assumptions and the overall classification scheme, the project's panel of twenty surgical specialists are examining all of the detailed data leading to the resource use values, the robustness of the classification model and advising on additions, adjustments and other refinements. To further validate the resource values, reported cost data from certificate of need applications especially on staffing, space occupancy, and technology are being examined. Reported costs from 1987 hospital cost reports are also being evaluated.

THE MODEL

EXHIBIT 2

OBSERVER: ____________
DATE: ____________

PAS WORK MEASUREMENT STUDY - RESOURCE USE DATA

FACILITY: ____________
PATIENT NO.: ____________
OR NO.: ____________

PATIENT CHARACTERISTICS

AGE: ____________
DIAGNOSIS: ____________

HEALTH STATUS:
- [ ] NORMAL HEALTH
- [ ] MILD SYSTEMIC DISEASE
- [ ] SEVERE SYSTEMIC DISEASE
- [ ] SEVERE SYSTEMIC DISEASE - LIFE THREAT
- [ ] MORIBUND

OTHER STATUS: ____________

PROCEDURE

DESCRIPTION: ____________
ICD9CM: ____________
CPT-4: ____________

AGGREGATE TIMES

TIME OBSER. INIT.: ____________
TIME OBSER. COMP.: ____________
AGGREGATE TIME: ____________

PRE-SURGICAL WORKUP

PAT. ARRIV. TIME: ____________
SURG. ENTRY TIME: ____________

ANES./CRNA NAME (1): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

ANES./CRNA NAME (2): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

SUPP. STAFF NAME (1): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

SUPP. STAFF NAME (2): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

SUPP. STAFF NAME (3): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

OTHER: ____________ (1): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

OTHER: ____________ (2): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

NOTES: ____________

OPERATING ROOM

PAT. ARRIV. TIME: ____________
PAT. DEPART. TIME: ____________

ANES. TYPE (1): ____________ UNITS: ______
(2): ____________ UNITS: ______

SURG. NAME (1): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

SURG. NAME (2): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

ANES./CRNA NAME (1): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

ANES./CRNA NAME (2): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

SUPP. STAFF NAME (1): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

SUPP. STAFF NAME (2): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

SUPP. STAFF NAME (3): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

OTHER: ____________ (1): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

OTHER: ____________ (2): ____________

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

OPERATING ROOM SUPPLIES AND DRUGS

SUPPLY (A) ____________ UNITS: ______
SUPPLY (B) ____________ UNITS: ______
SUPPLY (C) ____________ UNITS: ______
SUPPLY (D) ____________ UNITS: ______
DRUG (A) ____________ UNITS: ______
DRUG (B) ____________ UNITS: ______
DRUG (C) ____________ UNITS: ______
DRUG (D) ____________ UNITS: ______

IDENTIFICATION OF MAJOR EQUIPMENT USED

EXHIBIT 2 CONTINUED

RECOVERY ROOM

PAT. ARRIV. TIME: ____
PAT. DEPART. TIME: ____

ANES./CRNA NAME (1): ____

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

ANES./CRNA NAME (2): ____

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

SUPP. STAFF NAME (1): ____

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

SUPP. STAFF NAME (2): ____

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

SUPP. STAFF NAME (3): ____

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

OTHER: ____ (1): ____

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

OTHER: ____ (2): ____

	START	END	TOTAL
TIME (A):			
TIME (B):			
TIME (C):			

SUPPLY (A)		UNITS:	
SUPPLY (B)		UNITS:	
SUPPLY (C)		UNITS:	
SUPPLY (D)		UNITS:	
DRUG (A)		UNITS:	
DRUG (B)		UNITS:	
DRUG (C)		UNITS:	
DRUG (D)		UNITS:	

NOTES: ____

DIAGNOSTIC SERVICES

LAB PROCEDURE (A) ____
(B) ____
(C) ____
(D) ____

RAD. PROCEDURE (A) ____
(B) ____
(C) ____
(D) ____

PATIENT DISPOSITION

DISCHARGED: [ ]
ADMITTED: [ ]
OTHER: ____

NOTES: ____

EXHIBIT #3

MOST COMMON PROCEDURES AS A PERCENTAGE OF TOTAL PROCEDURES (SEED PROCEDURES)

PAS #	PAS NAME	MOST COMMON PROCEDURE NAME	PAS N	SEED PROCEDURE N	SEED PROCEDURE PERCENT
1	EYE RX	PTERYGIUM EXCISION NEC	2677	429	16.03
2	LENS	EXTRCAP LENS EXTRAC NEC	25272	17071	67.55
3	EYE REC	TEMP DETACH>1 MUS	1729	802	46.39
4	EAR RX	DESTRUCT EXT EAR LES NEC	979	788	80.49
5	MYRINGOT	MYRINGOTOMY W INTUBATION	7854	7477	95.2
6	EAR REC	MYRINGOPLASTY	608	298	49.01
7	NT RXDX	TONSILLECTOMY/ADENODEC	10164	1906	18.75
8	NT REC	SUBMUC NASAL SEPT RESECT	2632	991	37.65
9	ORAL RX	SURG TOOTH EXT	4413	3553	80.51
10	ORAL REC	TOOTH RESTOR BY FILLING	304	125	41.12
11	NERVE RX	CARPAL TUNNEL RELEASE	5683	4697	82.65
12	UPPER GI	OTHER ENDOSCOPY OF SMALL INT	10249	4261	41.57
13	LOWER GI	OTHER ENDOSCOPY LARGE	12760	7035	55.13
14	RECTLRDX	FLEXIBLE FIBEROPTIC COLONOSCOPE	7569	5791	76.51
15	ADB RXDX	LAPAROSCOPY	3884	3421	88.08
16	ABD REP	REPAIR INDIR ING HERNIA	6162	2167	35.17
17	SKIN RDX	OTHER LOC DESTR SKIN	19842	13816	69.63
18	SKIN REC	LID RECONSTRUCTION NOS	2949	626	21.23
19	BRST RDX	LOCAL EXCISION BREAST LES	11274	7232	64.15
20	BRST REC	BILATERAL BREAST IMPLANT	640	221	34.53
21	VASC RX	SIMP EXC LYMPH STRUCT NEC	1101	344	31.24
22	VASC DX	LYMPHATIC STRUCT BIOP	1655	700	42.3
23	VASC REC	LEG VARICOS V LIGA STRIP	413	250	60.53
24	BONE RX	REMOV INT FIX-TIB/FIB	4846	697	14.38
25	BONE REP	KNEE ARTHROSCOPY	5152	3288	63.82
26	MUSC RX	EXC LES TEND SHEATH HAND	6704	2074	30.94
27	MUSC REC	EXCIS KNEE SEMILUN CART	8238	4553	55.27
28	GYN RXDX	CERVICAL LES DESTR NEC	7103	1829	25.75
29	D&C	D&C NEC	24491	17134	69.96
30	OVARY RDX	BILAT ENDOS OCC TUBE NEC	7501	4852	64.68
31	MALE RX	CIRCUMCISION	4779	1599	33.64
32	MALE DX	PROSTATIC NEEDLE BIOP	1256	1074	85.51
33	MALE REP	ORCHIOPEXY	514	452	87.94
34	UROL RX	URETHRAL DILATION	3021	1183	39.16
35	UROL DX	CYTOSCOPY	11152	10390	93.17
36	UROL REP	HYPO-ESPADIUS REPAIR	119	119	100
TOTAL			225,689	133,245	59.04%

In this section, the general model of resources used in ambulatory surgery is presented, the need to recognize regional differences in costs is discussed, the sources of cost data for the model are identified, and the model's output is illustrated in two examples. Values that are identified in the discussion are preliminary as of this writing with final values for all thirty-six PAS groups completed by May 1989.

The resources used in ambulatory surgery and the components of the ambulatory surgery process were identified in the preceding section. In this discussion, these components are organized into a general model. The model assumes the use of a weighting approach to arrive at individual payment levels for each PAS category. The weight is the summed value of the various variables, and is calculated for each PAS and region. The values at this time are preliminary and are being refined with the assistance of the Project's Surgical consultants. To further validate the resource values, reported cost data from certificate of need applications and from 1987 institutional cost reports are also being evaluated. The model is the result of the following equation, which represents the sum of nurses labor cost plus supplies plus equipment plus both administrative and capital overhead;

RU(P)r=(PASOR(P)r + PASSUP(P) +PASTECH(P)) + (OVERHEAD(P)r + CAPITAL(P)r)

Where

r=region
RU(P)=Weight of PAS group (P)
PASOR(P)=OR nurses salaries for PAS
PASSUP(P)=OR supply cost for PAS incl. proth, disp sup, meds.
PASTECH(P)=OR equipment cost for PAS
OVERHEAD(P)=Personnel cost associated with pre/post operative and administrative overhead
CAPITAL(P)=PLANT overhead for PAS

RU(P)r=(PASOR(P)r + PASSUP(P) +PASTECH(P)) + (OVERHEAD(P)r + CAPITAL(P)r)

1. RU(P)=Weight of PAS group (P)

   This variable(the dependent variable) represents the total resource use for the PAS group P.

   RU(P)r=(PASOR(P)r + PASSUP(P) +PASTECH(P)) + (OVERHEAD(P)r + CAPITAL(P)r)

2. PASOR(P)=OR nurses salaries for PAS

   This variable in the model represents the nursing component of resource use. In general, two nurses are present during the operation, a scrub nurse and a circulating nurse. The scrub nurse is the individual who hands instruments to the surgeon, and who has previously sterilized his/her hands and wears sterile rubber gloves. The circulating nurse assists without intervening in the sterile operating field. The nurses are valued at a standard operating room salary schedule plus fringe based on 1000 hours of operating room time per year per nurse. The value of this variable varies by PAS based on operating room time.

$RU(P)r=(PASOR(P)r + \underline{PASSUP(P)} + PASTECH(P)) + (OVERHEAD(P)r + CAPITAL(P)r)$

3. PASSUP(P)=OR supply cost for PAS

This variable incorporates the resource use for disposable supplies, prosthetic devices, medications, and anesthesia. Items in this category include supply packs, syringes, blades, gowns, lens, antibiotics, solutions, and anesthesia. The value of this variable varies by PAS.

$RU(P)r=(PASOR(P)r + PASSUP(P)+ \underline{PASTECH(P)}) + (OVERHEAD(P)r + CAPITAL(P)r)$

4. PASTECH(P)=OR equipment cost for PAS

The equipment variable reflects the moveable capital resources used within the operating room. Examples of items in this category include: the table, microscopes, sterilizers, lasers, scopes, and reusable utensils. The values range between $50,000 and $200,000 and are amortized over a variable useful life and 1000 hours of annual operating room time.

$RU(P)r=(PASOR(P)r + PASSUP(P)+ PASTECH(P)) + (\underline{OVERHEAD(P)}r + CAPITAL(P)r)$

5. OVERHEAD(P)=ADMINISTRATIVE, PRE/POST overhead for PAS

This variable reflects the administrative resources associated with the surgery. This portion is valued at $40,000 per operating room for 1000 hours of annual operating room time. Non-OR nursing resources are also included in this variable. These resources include a prep nurse and two recovery room nurses valued on the basis of 1000 hours of operation annually for each of four operating rooms.

$RU(P)r=(PASOR(P)r + PASSUP(P)+ PASTECH(P)) + (OVERHEAD(P)r + \underline{CAPITAL(P)}r)$

6. CAPITAL(P)=PLANT overhead for PAS

This variable represents the "plant" or "rent" resources. These resource include both the structural resources and heat & light. The resources are valued based on the following; 14,000 square feet for a facility with 4 operating rooms. Each operating room represents 3,500 square feet of total(including support functions) building space. This in turn is valued at $25 per square foot annually per 1000 hours of operating room time.

$RU(P)\underline{r}=(PASOR(P)\underline{r} + PASSUP(P)+ PASTECH(P)) + (OVERHEAD(P)\underline{r} + CAPITAL(P)\underline{r})$

7. r = regional modifier

ASSUMPTIONS:

The value of each resource has been reduced to the lowest common denominator between facilities, the operating room. It also presupposes 1,000 hours of operating room activity per year. Although 14,000 square feet for a facility with four OR's is excessive it is recognized that some facilities may have limited latitude regarding space configurations.

DISCUSSION

Several important points relating to the model need to be understood. First, differences in costs of labor and space due to geographic differences are included in the model. These are discussed in a separate section. Second, costs for non-operating room labor and space are expressed as varying by PAS category based on OR time.

Non-operating room labor includes administration, pre-operative preparation of patients and recovery room activities. For administrative functions all procedures should be charged on the same per minute basis. Both pre-operative preparation and recovery room functions should be similarly dealt with. Differences in these resources are mitigated by the use of the procedure as the unit of observation, and ultimately payment. It is the number of procedures completed during the shift (as characterized by time) which is the basis of payment for these resources.

Actual patient specific differences are minimal, for example one patient may require 4 minutes of nursing time in a pre-operative area while another, because of a special need or patient age, may need 12 minutes of nursing time in the pre-operative area. The 8 minute difference only accounts for $2.27 (using an average nursing salary of $17 per hour) of a total procedure cost that range between $200 and $800. It should be noted that our observations revealed the least pre-operative time was required for podiatry patients and the greatest for intraocular lens implant patients.

Recovery room costs do not vary significantly within PAS categories, either. Most patients are checked every 15 minutes while they are in the recovery room with no discernible differences in time requirements per check due to procedure characteristics. Some patients, however, stay in the recovery room for longer periods of time. For example, one patient might stay only 90 minutes, while another might stay for 180 minutes. Since recovery room nurses spend 8 minutes per hour with all patients, the difference between 90 minutes and 180 minutes is 12 minutes of care, or $3.40 (based on an hourly nursing salary of $17). Again, this difference is insignificant for pricing purposes. These functions have been included in the overhead variable and are allocated based on the number of procedures during the shift (indexed time).

Space used for ambulatory surgery does not vary by procedure. Each patient uses the same pre-operative, operating room and recovery room space regardless of the procedure that has been performed. The length of use, not the physical space, varies. This variable is also allocated based on time.

It should be understood that the variable, PASSUP, in the model includes all drug and supply costs, including anesthesia and prosthetics. These costs do vary substantially among PAS categories independent of OR time. Equipment costs do vary among PAS, with eye surgery equipment costs at the highest level. Staff used in the operating room will generally consist of a scrub nurse and a circulating nurse (in addition to the surgeon and the anesthesiologist). Although unit costs for these staff members do not vary, their time in the operating room varies substantially among PAS categories. It is for this reason that operating room labor costs are presented in the model as varying by PAS category.

The model is based on resource use and cost data that can be collected in a matrix format. The matrix is based on resource variables of ambulatory surgery and ambulatory surgery activities. The matrix is presented as Exhibit 3 on the following page. It should be noted that the matrix can be used to present resources used in surgery or to present cost data. A separate matrix needs to be completed for each PAS category. This has been accomplished by completing the matrix for the most frequently performed procedure in each PAS category and then determining whether there are substantial variations in cost for procedures within a category that require adjustment. Exhibit 4 identifies the percentage of total procedures within a PAS category that the most common procedure represents.

It is important to recognize regional variations associated with space and labor. Differences in space costs per square foot may be associated with the age and location of the facility. Clearly, cost per square foot in New York is greater than cost per square foot in Buffalo. It is also important to recognize differences in labor rates throughout the state. Salaries of nurses with identical education and experience vary by location.

As noted, the Department of Health has compiled the ASDAP data base which includes the operating room time for more than 1,000,000 ambulatory surgery procedures performed on patients of all payors in New York State. The OR times, grouped by PAS category, have been used to identify resource requirements for OR staff. Two nurses are required in the OR for the full time identified for each procedure. Labor rates used to convert resource units (time) to costs are based on average nursing salaries in New York State. These salaries are adjusted for regional variation. In illustrations presented below, a $17.00 per hour salary plus $4.25 per hour fringe benefits are used.

Drugs, including anesthesia, supplies, including prosthetics and equipment differ substantially among PAS. For this reason, these resources are reflected in the model on a PAS-specific basis. Calculations of cost for drugs, anesthesia, supplies and prosthetics are straightforward. The requirements for these resources in each PAS is identified through observations and interviews with expert surgeons. A normative resource use standard is identified. Unit cost data have been gathered from facilities with an average unit cost applied to required resource levels.

Calculation of equipment costs is more complex. Costs for equipment required for all procedures have been identified. These total costs are divided by the number of procedures that they will be used for and a cost per procedure is included in the model. A similar approach has been used for procedure-specific equipment, such as lasers used for eye surgery and tourniquets used for podiatric surgery. Costs divided by useful life (measured by number of procedures) yields a per procedure cost.

Completion of a resource use/cost matrix (as presented in Exhibit 4) is required for each PAS category. Data has been arrayed to complete two matrices, one for D&C (PAS category D&CRX) and one for lens implants (PAS category EYEREC). These samples matrices are presented as Exhibits 5 and 6 on the pages that follow.

As noted earlier when all matrices are complete, costs will be available for the development of PAS category weights. Weights, not specific cost calculations, will be used to set prices. Note that illustrations are not adjusted for geographic variations.

Findings Related to Reimbursement Model Development

Several facets of the payment model are becoming clear from the project's research:

- Costs of labor and space vary due to geographic differences and thus need to be accounted for in the model.
- Operating room staffing does not appear to vary appreciably. OR time, OR labor measured in time, ancillaries, equipment, pharmaceuticals, supplies, anesthesia and prosthesis do vary by PAS category.
- Non-operating room labor, including administration, pre-operative preparation of the patient at the ASC and recovery room activities do not tend to vary by type of procedure within PAS category. The number of procedures completed during a shift (productivity) has an effect on the overall value of these resources.
- Recovery room costs do not vary significantly within PAS categories. Recovery room time is influenced by length or OR time and anesthesia both of which are normalized within a PAS group.
- Space used for ambulatory surgery does not vary by procedure. Each patient uses the same pre-operative, operating room and recovery room space regardless of procedure. It is the length of use, not the physical space that appears to vary by PAS. Space occupancy is also standardized through facility certification requirements such as a State Public Health Code.

Extrapolating these findings to specific values for each of the thirty six PAS categories will allow a specific weight to be calculated for each PAS which can then form the basis for a pricing system. The ASDAP data can then be used to evaluate revenue distributions for facilities and modelled also for payors. This work will be completed in the first six months of 1989.

Exhibit 4

RESOURCE USE ANALYSIS

PAS CATEGORY

	DIAGNOSTIC TESTS	PRE-OP ACTIVITIES	OR ACTIVITIES	POST-OP ACTIVITIES	RECOVERY RM ACTIVITIES	PATHOLOGY	TOTAL
PERSONNEL TIME:							
SURGEON							0
ANESTHESIOLOGIST							0
CRNA							0
NURSE							0
AIDE							0
OTHER							0
TOTAL PERSONNEL	0	0	0	0	0	0	0
ANESTHESIA							0
DRUGS							0
SUPPLIES							0
PROSTHETICS							0
EQUIPMENT							0
SPACE							0
ADMINISTRATION							0
TOTAL	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

RESOURCE USE ANALYSIS

EXHIBIT E

PAS CATEGORY PAS #29 D & C

	DIAGNOSTIC TESTS	PRE-OP ACTIVITIES	OR ACTIVITIES	POST-OP ACTIVITIES	RECOVERY RM ACTIVITIES	PATHOLOGY	TOTAL
PERSONNEL TIME:							
SURGEON							0
ANESTHESIOLOGIST							0
CRNA							0
NURSE		6	37.86	6			49.86
AIDE							0
OTHER							0
TOTAL PERSONNEL	0	6	37.86	6	0	0	49.86
ANESTHESIA			50				50
DRUGS			20				20
SUPPLIES			20				20
PROSTHETICS			0				0
EQUIPMENT			10				10
SPACE			48				48
ADMINISTRATION			24				24
TOTAL	$0.00	$6.00	$207.86	$6.00	$0.00	$0.00	$221.86

RESOURCE USE ANALYSIS

EXHIBIT 6

PAS CATEGORY PAS #2 LENS

	DIAGNOSTIC TESTS	PRE-OP ACTIVITIES	OR ACTIVITIES	POST-OP ACTIVITIES	RECOVERY RM ACTIVITIES	PATHOLOGY	TOTAL
PERSONNEL TIME:							
SURGEON							0
ANESTHESIOLOGIST							0
CRNA							0
NURSE		29.33	123.4	29.33			182.06
AIDE							0
OTHER							0
TOTAL PERSONNEL	0	29.33	123.4	29.33	0	0	182.06
ANESTHESIA			100				100
DRUGS			50				50
SUPPLIES			70				70
PROSTHETICS			200				200
EQUIPMENT			97.78				97.78
SPACE			117.33				117.33
ADMINISTRATION			58.67				58.67
TOTAL	$0.00	$29.33	$817.18	$29.33	$0.00	$0.00	$875.84

APPENDIX F:

Future Research

Future Research

Additional research already underway or in the planning stage would add substantially to the Health Care Financing Administration's (HCFA's) knowledge base and serve to support the decisions regarding the design of a new prospective payment system (PPS).

A. Future Work to be Completed by The Urban Institute and Brandeis University

The Urban Institute and Brandeis University are continuing their research efforts and will complete their work prior to submission of the comprehensive PPS report due to Congress January 1, 1991. These efforts are enumerated, in part, below:

The Urban Institute

- Using HCFA's data files, complete episode of care analysis for surgical procedures including both the physician and facility components.
- Define episode of surgical care and identify the total bundle of services that should be included in the outpatient surgery PPS rates.
- Ambulatory Surgery Center (ASC) cost study to determine which ASCs are the most cost efficient as well as whether ASCs or outpatient departments are more cost efficient.

- Conduct simulation analysis of alternative classification/payment systems that incorporate an episode of care as the unit of payment.

Brandeis University

- Separate analysis of ambulatory surgery performed in emergency departments.
- Analysis of ambulatory surgery for disabled population under age 65.
- Analysis of resource use as it relates to cost using Hospital Cost Report Information Systems charge converters including variables such as teaching, nonteaching, urban/rural.
- Special data analyses of colonoscopies and endoscopies.
- Refinements to preliminary results regarding the use of ambulatory visit groups for ambulatory surgery.

B. Other Studies

In addition to the above activities, we are planning to conduct studies on ambulatory surgery outcome measures for evaluating the outcome of ambulatory care delivered to Medicare beneficiaries. Future research is also planned to develop trend factor refinements, a severity index measure for outpatient services and further work may be done to validate and refine other existing outpatient classification systems (e.g., Patient Management Categories), Emergency Department Groups for ambulatory surgery payment, and Ambulatory Morbidity Groups - a case mix study establishing clinical measures of illness).

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